MAN'S FOOD: Its Rhyme or Reason

MARK GRAUBARD

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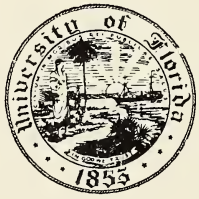

MAN'S FOOD,
ITS RHYME OR REASON

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ITS RHYME OR REASON

BY

MARK GRAUBARD

NEW YORK

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1943

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Introduction

THIS VOLUME differs from other books on food in that it deals as much with man as it does with food. Its main concern is essentially with man's attitude toward food throughout history, before and during the evolution of the science of nutrition.

In its infancy this work had the form of a series of articles in the labor press, conceived as an experiment in adult education in nutrition so urgently needed now, not only for optimum individual health and national welfare but for international cooperation in winning the war and in building a lasting peace. The articles enjoyed a surprisingly enthusiastic reception, surprising to those who are at all familiar with the powerful resistance to education with which adult human beings are afflicted.

As a result of the favorable response to these articles by labor and non-labor publications, the American Federation of Labor issued them in pamphlet form, and in several editions, for the benefit of its membership. This educational measure was due to the enlightened interest of Mr. I. M. Ornburn, Secretary-Treasurer of the Union Label Trades Department (A.F. of L.), who stated in the introduction to the pamphlet that these "timely and valuable articles are replete with human interest about nutrition and health. They are also educational because of their historical background." It was as a result of this popular interest that the material was expanded into its present form for a wider circle of readers.

To most of us food seems to be a dull subject, because we fail to realize that its consumption is a human activity rather than merely a biological one. Such failure need not surprise us, living as we do in an age in which more is known about engines, chemicals, radios, and airplanes than about human conduct. Yet what could be closer to our experience than the facts surrounding food? In spite of this, the science of nutrition and the study of the psychological problems

involved in changing food habits and agricultural production are recent subjects. Surely the need for greater knowledge of these problems ought to be of immediate urgency to us, because if we could use science to gain mastery over food production, and if we could combine science with our humanitarian faith to effect a sound and just distribution of it, a great step forward would have been taken toward our goals of freedom from want and freedom from fear.

Unfortunately, man has always found it more enjoyable to dream his hopes and aspirations than to work for them in a practical, scientific manner. Thousands of years ago he sang and dreamt, and beautifully at that, of justice and brotherly love, of a better world to come and of retribution against evildoers. He prayed to God for his daily bread, prescribed rules for what should be eaten and what should be avoided as impure or "an abomination," and left the food situation at that. Only within the last decade has the problem of food received more serious attention.

In May 1941, President Roosevelt called the first National Nutrition Conference. This act constituted the first effort at awakening the American people to the realization that adequate food and sound eating habits should be the concern of the people themselves as well as of their government. Out of this conference emerged the national nutrition movement, working through state, county and city committees and coordinated by a government bureau under the guidance of Dr. M. L. Wilson, Director of Extension Service of the Department of Agriculture, and Dr. W. H. Sebrell, Chief of Chemotherapy in the United States Public Health Service. This office of nutrition is now part of the United States Department of Agriculture under the same leadership.

My own task has been that of guiding labor education in nutrition, which meant stimulating trade unions as well as other labor organizations to acquire and to put into practice nutrition information. In wartime such an activity involves as well intelligent cooperation with the exigencies of existing food situations however they may be shaped by changing events. In this effort the cooperation of the American Association for the Advancement of Science was sought

so that labor organizations might call upon local nutrition committees who would then avail themselves of local scientists to organize courses, demonstrations and discussions in nutrition. This was to be done at regular union meetings rather than through special lectures, so as to reach large numbers of workers. Avoiding special courses would help in keeping the campaign free from assuming an educational halo seldom successful with adults, and would convert such activities into regular functions of labor unions.

As permanent secretary of the American Association for the Advancement of Science, Dr. F. R. Moulton has taken a lively interest in this work. Much nutrition information has already become widely diffused throughout our population and has affected the food folklore of most people, as well as their actual dietary practices. But there is still much to be done, especially with that group of the population whose income is inadequate and those of the lower income groups who stand most urgently in need of nutrition information. The nutrition movement has matured in recent months and its organization is now fully prepared to lead in this task of mass education. The stage is set, and scientists, labor organizations, government agencies, and numerous communal and civic bodies are ready to go ahead. The urgency of the times expressed in rationing, shortages and in the need for aid to our fighting allies and to liberated but starved populations, constitutes a stimulus and challenge.

Adult education, like the brotherhood of man, is a laudable objective though difficult to achieve. To develop an interest in food, its role in health and welfare, its role in winning the war, in rescuing the people of lands devastated by Nazi or Japanese fury, in planning for a peace in which freedom from want is to be a reality, in laying practical and constructive foundations for a better life—more than talk of vitamins and nutritional deficiencies is necessary. When the program of the recently held United Nations' Conference on Food and Agriculture is laid before the people, the tasks ahead will no doubt be made clearer and their pursuit will in all likelihood be more stimulating to the average citizen.

It is hoped that this volume can make some contribution in that

very direction. The reception accorded the material in the past adds strength to such hope.

To Drs. M. L. Wilson and F. R. Moulton and to the organizations they represent are due my sincerest thanks for encouragement and for cooperating in the pretesting of the material. It is a pleasure and an honor to have this work included by the American Association for the Advancement of Science in its non-technical science series.

MARK GRAUBARD

Chapter I

Why a Nutrition Movement?

Common sense tells us that human beings should be most acutely concerned with their own health, and avidly cater to its needs. Surely self-interest could not wish for a better field for self-expression. If anything, one should have suspected that education would be taxed to keep self-interest in check rather than spur it on to action. How surprising it is, therefore, to discover that such a large percentage of our population, rich as well as poor, are badly nourished and carry about with them concrete evidence of self-inflicted maltreatment! Still more amazing is it to observe their reaction when told that their choice of food is not of the kind that would lead to health and vigor. They become more irritated and offended than when reproached with being unfair or unethical. They know, they claim, what they like, they know what is good for them; they have eaten the food they prefer for many, many years and found nothing wrong with it; their parents ate that kind of food and lived to a ripe old age, etc. Many then supplement this array of arguments with another series. They claim that the newer knowledge of nutrition is only a fad, that vitamins are a racket for doctors, druggists and drug manufacturers, and that our food is unnatural anyway. They may end by developing a homemade theory of nutrition borrowed from some popular faddist and ornamented with their own peculiar contributions.

Their suspicion of, and resistance to, new ideas are only natural and need cause no alarm. Also, instances of man's perversity in seemingly straightforward biological spheres have been known in the past. Very few people realize that while most primitive nations knew a good deal about tattooing, scarification and deformation of many external organs, they practiced mighty little desirable surgery. Light wounds and cuts were generally neglected, and while knives

were wielded freely in primitive ritual or custom-dictated maiming, they were seldom if ever used for operations.

But times have changed. Surgery is now one of the proudest spheres of medicine, and man's attitude to food is now equally undergoing dramatic changes. Of late, definite signs have appeared of a growing disintegration of the once prevalent resistance to nutritional education. Food awareness is literally on the verge of sweeping the nation, and people everywhere are beginning to inquire and think sanely about food and its significance to health, morale, efficiency and even longevity.

It must be repeated, however, that the public is only beginning to be fully acquainted with the problem. And at that, it required the war emergency, and the results of the physical examinations of our draftees to stir us violently out of our nutritional indifference and make us hear the call for action.

While many are the evils besetting man for which science and wisdom cannot as yet offer alleviations or solutions, there is room for considerable pride and gratification in the achievements of nutritional science. Horrible and fatal diseases, ascribed in the past to miasmas, winds, fevers, fate and other such agencies, have been demonstrated beyond a shadow of doubt to be due to a lack of some food component, minute in quantity, but without which the body cannot function properly. Under these circumstances of shortage, the body may be compared to some complex network of electrical signs, bells and gadgets which cannot keep going or even get started if a tiny connecting piece of metal breaks in a fuse or switch.

The cures are often just as dramatic as the replacement of a burned out fuse. Writes R. R. Williams, the Bell Telephone Company chemist and discoverer of thiamine or vitamin B_1: "On several occasions in the absence of a medical associate, I went at the call of a public health inspector to the Tond slum district of Manila to attend without benefit of medical certificate reported cases of beriberi. Often I dosed the baby myself to be sure to get as much of my precious preparation inside and as little outside as possible, and sometimes sat down beside the anxious mother on the split bamboo

floor of the little nipa shack to await results. Within as little as three hours I have seen the cessation of the weird, almost soundless crying which, due probably to paralysis of the larynx, is characteristic of the last stage of the malady. Easing of the gasping breathing soon followed, and then occurred the smoothing of the wild pulse, the fading of blue lips, a hungry nursing, and peaceful sleep."

A nutritional deficiency often struck the population as a whole, as when a tribe migrated through a desert and of necessity had its diet limited to one or a few items. It was not one or two unfortunate individuals that were afflicted, but a vast section of the population. This was called a plague, though today we retain the term exclusively for sudden flareups of bacterial or virus diseases. Driven to despair, humanity resorted to magic, amulets, and prayer, to persecution of witches, fumigation and sacrifice. But all to no avail because with no trace of suspicion, man hugged tenaciously his traditional and cherished food habits, thus pumping misery into his system, and defying those who would help him.

Surely this problem is simple, one can hear the reader say. Lay the information before the public, acquaint people with the facts, and who but a fool would refuse to act instantly for the protection of his own health and happiness, and save money on doctors' bills to boot?

If education were effective in this direct manner, humanity would indeed go very far in a short time. But human nature is more complex, and life consequently presents many more difficulties than one would expect on purely logical grounds.

Man is very much the product of his habits—habits of practice and habits of thought. To understand the difficulties they raise, one merely has to look around and face the facts. Almost half of the world's population lives on rice as its staple food. Another 40 percent, to which we belong, wants its daily bread instead. Would that habit be easy to change? Try it. Tell an Italian, for example, not to eat spaghetti but to consume some other starch instead. This is merely an illustration and has no scientific meaning. Will the change take place readily?

Does cognizance of the truth and acceptance of its desirability give the will immediate power over the enslaving force of habit and conditioning? Permit a smoker who has decided to abandon that habit for one reason or another, to tell you the true answer to this question. And suppose some people who were raised on bread and jam, potatoes, beef, pudding and coffee are told that their health requires, nay demands, that they have some raw fruit, milk and vegetables. Will they respond in the phrase of the Bible, "We shall do, we shall obey"? If they do make that promise, they will probably adhere to it about as faithfully as did the children of Israel to theirs.

Take the case of coffee or tea with which so many of us are accustomed to finish a meal. Millions in this country would suffer discomfort and irritation if they were deprived of coffee at breakfast or were obliged to drink milk instead. This is true of people who know all about sound feeding as well as those who are entirely ignorant of it. The source of the evil is not ignorance or malice but certain tastes formed by habits.

Often the habits themselves are not entirely imposed but have deeper roots. For example, the following agricultural items among others were taken to Europe from America: the potato, corn, the tomato and tobacco. Tobacco spread throughout the world in less than fifty years; the potato went begging for about two hundred and fifty years, the tomato four hundred years, and maize is still being stubbornly resisted by most of Europe. In a way this is not too surprising because narcotics and inebriants of some kind are as old as man and even the most harmful ones are dislodged with great difficulty.

The penetration of the potato into the agricultural pattern of Europe affords an interesting illustration. Spanish explorers found the potato in Peru and imported it to Spain. Europe refused to grow it and the rumor spread and maintained itself throughout the sixteenth, seventeenth and even eighteenth centuries that it poisoned the ground and caused diarrhea. Late in the seventeenth century, it suddenly caught fire, as it were, in Ireland, became a staple food there and rapidly diffused into England. Its ill-fame kept it out of the

European continent, however, in spite of the fact that hunger, brought on by crop failure, stalked freely about the land every few years.

The well-known scientist, Benjamin Thompson (Count Rumford), who as a royalist left his native Massachusetts in 1776 to go to England, found himself at the close of the century in the position of military adviser to the Duke of Bavaria. Seeing the plight of the local farmers, he felt convinced that if they could be persuaded to abandon their resistance to the potato, they would have something to eat when their cereal crops failed. And crop failures were frequent in those days. But neither persuasion nor demonstration won him any converts.

He finally hit upon the following idea. As head of the army and ordnance, he employed his authority to make every soldier in the Duke's forces plant a patch of potatoes, care for it, harvest it and eat the tubers. The duration of military service in those days gave a soldier more than ample time to learn the art of raising potatoes and of developing a taste for them. After the men returned to their farms and villages, potato crops appeared all over the country and the food of Europe gained greater security.

Indian corn fared far worse. It too came to us from the American Indian, was exported first to Spain where it won speedy acceptance and soon diffused from there to most Mediterranean nations. Some countries in Central Europe, such as Hungary, received it well but Germany, Poland, Russia, France, England and many others would not have it. The usual argument of the population is "that's cattle feed," which verdict condemns beyond reprieve any food in most peoples' eyes. This judgment is reminiscent of a Canadian farmer who classified all foods into two groups: "Fit to eat," and "the Injuns ate that."

On the whole, we shall find that the subject of food presents a picture similar to every other social problem. No sooner does man become aware of a social difficulty or injustice than his mind begins to grapple with it. His tendency is to elaborate quickly a solution which like all of man's explanations may be rooted in fancy, emo-

tion, wish, critical or uncritical observation or in various combinations of these factors. Such solutions and goals may inspire millions of adherents and for centuries humanity may strive to reach them but to no avail. Aware of continued failure, man will still cling to his ideal, find solace in its formulation, though its translation into practice forever eludes him.

Surely, scientific nutrition will not meet the same fate if we make up our minds to be scientific about achieving it. By being scientific is meant not the fetish of quantity and measurement, the employment of the latest apparatus or of elaborate chemical equations. By this term is meant instead the recognition of all the forces involved in our problem and giving them due weight and consideration. And one element which all social and moral leaders of the past either overlooked or grasped imperfectly was the nature of man. Of course, we do not know as much about man as we need so badly to know, but we do know a bit more than we did in the past. And we know that it is folly to call people ignorant or stupid when, after all the facts about sound nutrition have been laid before them, they still persist in their harmful old habits. Our task is to *know* man, and not to judge him. Similarly, a biologist must first get to know the rat before he can attempt any nutritional experimentation upon it. Only failure will follow his efforts if the nature of the experimental animal is not considered. And blaming the failure on the animal is a poor way of shielding the true culprit.

The establishment of sound nutritional habits implies some knowledge of the psychology of eating, of the past record of man's attitude toward food, hence, anthropology and religion, of the social factors influencing his choice of food and its availability, hence sociology and economics. It is only when these items are given their proper weight that the findings of the science of nutrition can be brought to play upon our subject, man, with any modicum of expectation of success. Repeating nutritional truths without regard to these forces is like singing of spring in the dark of a winter storm and expecting flowers to blossom forth on the spot.

The integrated picture of the food problem needs special atten-

tion now because of the gigantic struggle in which our country is engaged against nations whose sole aim is to conquer, enslave and dominate. "Eat The Right Food, U. S. Needs US Strong," is a meaningful slogan. It is an added incentive for curbing one's cherished but harmful, or at best unhealthful, food habits. The appeal to patriotism which is synonymous now with defense of world democracy, the appeal to national self-preservation, must be looked upon as one of those fortuitous circumstances, which occasionally conspire to weaken the resistance of habit and permit a desirable but novel element to penetrate into a folklore and become firmly merged with its web. Social reformers would do better if they looked for such helpful circumstances rather than waste their efforts in upbraiding the flock they seek to help for their ignorance and all others for plotting to keep truth and salvation away from the masses because of "vested interests."

It is this attempt at a social or integrated viewpoint on nutrition which justifies the publication of the present volume. Sound nutrition has now become a national problem rather than a branch of biochemistry or physiology. Just as two hundred and fifty years ago, when the issue was vaccination, a science stepped forth and said, "Not only must I be heard, but my message must be accepted," so nutrition comes forward today and declares: "People of America. You expect your government to legislate for your social, economic and political welfare. You expect your government to defend you against the battling forces of darkness, murder and slavery. But, you too must do your share. Learn to be healthy. Whether you are a soldier in khaki, a soldier in overalls, a soldier on the home or kitchen front or in the school (and we are all soldiers in this total war) you owe it to yourself, to your nation, and to the menacing urgency of the present situation to think more of your food habits than ever before, to care for your health as never before so that you can do whatever duty is yours in good spirit, good morale, and good health. Let the science of nutrition and mastery over the difficulties lodged within yourself and society show you the way."

The rapid spread of Nazism in Germany, its loud-mouthed

arrogance, its blood-thirsty exuberance and love of pomp and fanfare have led many to believe it had gained its popularity entirely by propaganda, bribery, by a subsidized press, by promises and lies. This belief flows from the prevalent assumption that the majority of humanity can be manipulated at will like marionettes by some group in power, or by money, and that like brainless putty they can be fashioned by sly words and well-directed phrases.

The lessons of sociology are in complete disagreement with such a view. They tell us that as human beings we are strongly dominated by our beliefs in morals as well as in religion, in diet as well as in dress. Once a belief is established, it evolves a logic and consistency all its own which parries objections or change as easily as a duck sheds water. Not only are words and phrases impotent in changing beliefs but the most wondrous experiments of a Galileo or a Pasteur, the most moving logic of a Socrates, or the rhetoric of a Danton may fail to stir even their peers in training or competence, if the ramparts of belief bar the way.

Propaganda alone can never break or make a popular belief though it may happen to speak in the name of science or even self-interest. The propagandized idea must make contact with a basic desire dormant in the population. And that desire must somehow catch fire or become otherwise sensitized. Propaganda can then inflate it out of all proportion.

With this in mind, it is not difficult to perceive that education in nutrition has made an amazing start. Its call is definitely falling now on receptive ears and the public is responding beyond expectation. It is not too much to state that within a relatively short time scientific findings will guide our eating habits, just as fear and superstition ruled the lives and activities of primitive man.

Changes in our food habits must be spontaneous and not compulsory. The nature of nutrition education must be such as not only to give people the facts but also the strength for control of their own eating habits and tastes. This can best be done by a nutrition movement expressing the people's quest for better food customs rooted in science rather than in a tradition nurtured by a medley of

forces working at random. Once this desire for a scientific pattern of conduct has caught the popular fancy, as did the desire for hygiene seventy years ago, after the dramatic experiments of Pasteur and Lister became known, then the achievement of the goal is within easy reach. The plain and the sophisticated desire it; the rich and the poor practice it. Like painted fingernails or movies, it would then reach the entire population.

The quest for good food habits must be a people's movement. It must shun too didactic or pedantic approaches except for those who wish some amount of specialization. It must aim at introducing habits rather than calculations of vitamins and calories before and after eating. As we shall see, food lies more in the realm of human psychology than in the sphere of biology or even economics.

Chapter II

How Food Habits Concern Us

Nature solved the food problems of most animals in a remarkably simple manner. Each animal is endowed with specific biologic and psychologic reactions which limit its choice of food and adjust its needs and functions to harmonize with the diet. A horse eats grass, a lion eats meat and their menus are seldom if ever confounded. Recent experiments prove that when rats are given a choice of foods, they will select that diet on which they prosper best. On the other hand, older rats already accustomed to a particular diet, fail to select as beneficially as young ones. This seems to apply on the whole to human beings as well, although children tend to be rather shy of new foods.

To study man's attitude toward food, it is imperative to take into account the various eating habits of the entire species of man, for as long a period as records permit. We then find that the diets of human groups vary widely and that truly one man's meat is another man's poison. Moreover, it is not only particular foods that happen to vary widely for different groups but the accompanying dietary notions and emotional attitudes differ as well. Let us consider a few illustrations, because one can never really know one's own difficulties or those of one's group as a whole unless one constantly observes and studies other people for purposes of comparison.

Let us start with material bearing upon ourselves so as to avoid the impression that the conclusions refer to others, to customs long outlived and forgotten, to savages and strangers with whom we have little in common. This, of course, is a widespread and deep-seated delusion. But it so happens that all human beings are exceedingly human and that "for whom the bell tolls it tolls for thee." What is true of other human cultures is, broadly speaking, true of us. And

if it is an evil or laughable thing we observe in others, we should immediately examine ourselves for symptoms or residues of that very feature. Only thus will we gain the power to pluck it out if we still have traces of it or keep it out permanently if, by chance, we happen to be free of it.

Because the Bible relates the life and customs of the Hebrew tribes, it also records their dietary practices and beliefs. All animals with uncleft hoofs and not ruminating were declared impure. So were fish without fins and scales, all worms, shellfish (Crustacea), snails, squid (Molluscs) and most birds. The reason for the prohibition is not that these items are detrimental to health. They were not then, nor are they today. The Bible merely reiterates that they are "an abomination" and "unclean." "All fowls that creep going upon all four shall be an abomination unto you. Yet these may ye eat of every flying creeping thing that goeth upon all fours which have legs above their feet to leap withal upon the earth . . . the locust after his kind, and the bald locust, and the beetle after his kind and the grasshopper after his kind." The warning "Thou shalt not seethe a kid in its mother's milk" is given three times.

Equally typical and interesting are dietary rules of India which are far more complex than the Biblical. Here, too, prohibited food is considered "unclean" and an "abomination." In addition, all dietary restrictions center about the institution of caste as does most of Hindu life. Thus, Brahmans, the highest and the divine caste, regard as polluted all water and food touched by any other castemen. Food upon which the shadow or even the gaze of a lower casteman, a Christian or foreigner, happened to fall is polluted, uneatable and must be destroyed lest others eat it and suffer unconscious pollution.

"Clean castes do not pollute water; but below them are castes which pollute an earthen vessel, then castes which pollute a brass vessel." From some castes a traveling Brahman may only accept dry food; from others, only food cooked in water; from still others, food cooked in oil. Partaking of certain foods leads to loss of caste which means becoming an outcast. That state is held in contempt even by the lowest groups and incurs endless misery and abuse.

Brahmans and other high castemen normally eat no meat or fish which are considered polluting. Members of different castes may not dine together, just as they may not intermarry. Interdining is a serious social and religious offense and leads to grave consequences.

This kind of dietary segregation is still practiced in our South and is also made familiar to us through the Bible. When the sons of Jacob came to Egypt the second time to buy corn and brought Benjamin with them, Joseph invited them to lunch with him and said, "Set on bread. And they set on for him by himself and for them by themselves and for the Egyptians which did eat with him by themselves: because the Egyptians might not eat bread with the Hebrews; for that is an abomination unto the Egyptians."

The Bantu tribes of Africa, most of which are pastoral, subsist mainly on milk as their staple food. Cattle are held by them in great veneration and beef is eaten only on rare occasions. All work relating to dairying and the care of cows is performed by men. It is a heinous crime for women to come near a cow or be near the corral at milking time, touch a vessel containing milk or even touch a man who is about to milk or has just finished milking. Women may only wash the earthenware milk pots and do the churning to make butter which is used little as food and mostly to anoint the body.

It is believed that milk, meat and vegetables must not mingle in one's stomach because the cows are sure to sicken if that happens. Vegetables are seldom eaten, in fact only in times of extreme milk shortage "when pressed by hunger. During her menses a woman may not drink milk except from an old cow past bearing; should her husband fail to procure such a cow she eats vegetables until she is well again."

With some tribes, milk must never touch a metal vessel and generally must not be boiled; with others, it must never be drunk fresh but clotted. "The meat of goats, sheep, fowls, and all kinds of fish is deemed bad and is absolutely forbidden to any member of the tribe." In most cases cultivation of the soil is prohibited or at least held in contempt. Social status is determined by the number of cattle one possesses and only with cattle can a young man procure

a wife. Cattle are never killed except on ceremonial occasions by the very wealthy and beef must be roasted on a spit and never touch a metal pot. Besides, it may be consumed only in the evening. Beer must be drunk with it and milk abstained from for twenty-four or even forty-eight hours afterward.

Milk from cows past bearing must be kept apart and may be used exclusively for menstruating women. After delivery, women may drink milk only if the baby is a girl. Men, too, may have special prohibitions imposed on them. For example, in some cases they may not drink sheep's milk which is permitted to women. Carrion, which is strictly prohibited in the Bible, is the only meat ever eaten by most pastoral Bantus.

All functions relating to milking, to the position of the cow during the process, to storage and consumption of milk, to herding and the care of cows, anything relating to the kraal, the sacred fire that must burn there eternally, in fact, all activities even remotely related to the food problem, fall under strict regulation of custom, law and religion. These customs reach their greatest complexity in the preparation of milk for the king and in the treatment of the royal herd.

There is hardly a type of food that fails to be singled out for special discrimination by some group. Fish, vegetables, meat, tubers, roots, berries, fruit, fowl, and eggs all come under ban somewhere. And the reasons given for their prohibitions vary from culture to culture. That these prohibitions are seldom related to welfare or economic motivation as we understand them, can plainly be seen from the evidence. Rather are they based upon *beliefs* maintained at the time. Writes a student of Australian natives: "No sooner does a boy begin to go about in the bush in search of food than he finds himself very considerably restricted as to what he may and may not eat. Should he eat kangaroo tail or wild turkey, or its eggs, then he will become prematurely old; parrot or cockatoo flesh will cause the growth of a hollow on top of his head, and of a hole under his chin; large quail and its eggs cause the beard and whiskers not to grow; any part of the eaglehawk other than the sinewy legs will

produce leanness, though the strong legs are admirable, as they improve the growth of the same limb; in fact, to strengthen the limb, boys are often hit on the calf by the legbone of an eaglehawk, strength passing from the one into the other. Should the podargus, or night jar, be eaten, then the boy's mouth will acquire a wide gape."

Many unique food prohibitions seem to have originated in one particular region and spread from there to other countries. While some have diffused from one group to another, others are found in widely separated parts of the globe where they clearly arose independently. For example, fish is found to be completely prohibited by tribes in Tasmania, Asia, Africa, and the Americas. Tribes who look down upon vegetables as an important dietary item are also found scattered all over the globe. Similarly, non-meat eating tribes or castes occur in India as well as Africa and America.

Often food prohibitions apply to one sex only as when the flesh of carnivorous animals as well as that of the hare is forbidden to Hottentot men only. But it is women who by far bear the brunt of the burden. Special restrictions are imposed upon women in one or another of their physiological stages, such as prepuberty, menstrual, pregnancy and maternity periods. These are all explained on the ground of preventing evil to the person or embryo or child, respectively.

Most mourning rituals require dietary abnegations or limitations. Often this custom goes so far as to require of all those who had come in contact with or were related to the deceased to eat apart, consume specific foods and abstain from others. The death of a chief or leader may force a tribe to fast for periods longer even than seven days. To balance the picture, enforced starvation of the living may go hand in hand with generous supplies of food burned for or burned with the dead.

That dietary habits make deep inroads into religion is common knowledge. Such interlinkage is as apparent in our own society as it is in the life of India where its influence is more pervasive and conspicuous. Food plays, in addition, a major role in most ritual.

Certain foods are reserved for priests or as sacrifice to the gods and may not be used otherwise.

The very manner of eating has also been subjected to a variety of rules. While in our culture a meal may become a family ritual, many are the human groups which demand that men and women eat apart and that they use separate utensils. In many places, it is a disgrace to be observed in the act of eating, especially by one of inferior social status. Specific table manners, or socially accepted ways of eating prevail everywhere. But the manners of others appear strange and uncouth to each group.

Even the contemporary Nazi custom of allocating certain foods, such as fruits and vegetables, for Germans only, prohibiting their consumption by conquered groups, such as Poles or Jews, has had its precedent in man's troubled past. The well-organized militaristic Inca state which resembled in many ways the Nazi system of state socialism, compelled its regimented agricultural and pastoral workers to produce a surplus for the maintenance of the army, officials, priests and nobles. The standard of living of the lower classes was regulated in a manner resembling religious strictures. Numerous delicacies, strong intoxicants and coca were the exclusive privilege of the rich, prohibited at the risk of severe penalty to the workers.

Another human element which exerts a mighty influence upon the biological process of feeding is prestige. There is more truth than meets the eye in Lowie's assertion that man is more of a peacock than either an economic or biologic animal. While it is true that man must eat, it is also true that he will fast and destroy much precious and hard-earned food, to say nothing of his inflicting inconceivable torture upon himself, when the quest for prestige dictates. "The lack of purely economic points of view is everywhere visible in the life of primitive peoples. On various occasions valuable food-stuffs and stocks of all kinds are destroyed, burned, or thrown away from motives connected with religion or witchcraft," writes R. Thurnwald. The author further adds, "All observation of primitive peoples teaches us that the social motive, the desire for an exceptional position in the group has outweighed the economic motive." The Tro-

briand Islanders, as observed by Malinowski, afford a relevant illustration. The natives build their yam houses so that their contents can be seen. Extra large yams are framed, painted, decorated, hung outside for display and left to rot. Their owners will seek wild fruits and roots in the forest rather than eat the yams needed for display. In fact the right to display yams at all is a great privilege, reserved for the upper class, and poor people must cover the front of their yam houses and fatten on their contents.

A similar example is supplied by the well-known institution of the potlatch. Prestige among the wealthy Kwakiutl Indians is obtained by throwing a party to display one's ability to burn food and blankets, destroy canoes, kill slaves and melt most precious and highly valued decorated pieces of copper. "Furthermore, such is my pride, that I will kill on this fire my copper Dandalayn which is groaning in my house. You all know how much I paid for it. I bought it for four thousand blankets. Now I will break it in order to vanquish my rival. I will make my house a fighting place for you, my tribe. Be happy, chiefs, this is the first time that so great a potlatch has been given." Words like these cause the hearts of all tribesmen to swell with pride. If the invited chiefs who come properly prepared but are taken by surprise and cannot match the quantities destroyed by the host they are defeated and lose status.

The fact that food plays a role in bestowing social prestige is no novelty to us either. Surely herring does not go well with a flashy party, while caviar does. Steak is still generally considered a prize dish in our society, while pigs' knuckles are not. Yet in numerous primitive tribes the chiefs and medicine-men must be paid tribute to first, by a donation of the organs or other parts of captured animals, which are definitely looked down upon by us. The muscle and steak were left for *hoi polloi.* In ancient Egypt, the land of greatest culture and progress at the time, it was the forelegs of killed or sacrificed animals that were considered most precious and therefore given to the king or high priest.

Even in our own society recipes are often kept secret by some hostesses so as to monopolize a source of bragging. But there are

other societies in which the case is different. Among Greenland Eskimos the host will do everything in his power to belittle his food before his guests. True, it is merely a technique, a surface expression hiding the same satisfaction at pleasing or impressing others that we have. But then are not all differences in social conduct of a similar nature?

After his guests have been about the house long enough to be seriously hungry the host will exclaim, "Now I am really lost because I was such a fool as to invite you to taste my food. Everybody knows how miserable it is, how putrid, how filthy, etc." This kind of abuse or belittling goes on until words fail him and the appetite of his guests grows to violent proportions. The more highly the host thinks of his food the more abusively he speaks of it. The audience understands it, of course, and life goes on smoothly.

For that matter the same kind of berating with reverse meaning goes on in stores. Unlike our custom over a bargaining counter where the owner praises his goods for sale and the prospective buyer belittles them so as to force down the price, the roles are completely reversed. The owner will request, for example, eighty cents for a knife. He will be slow in announcing the price but insists the object is unworthy, cheap and poor in quality. After the price is finally divulged, the customer will take up his or her share of the act and insist that contrary to the owner's opinion, the knife is extremely good, in fact too good for such an unworthy person as the buyer is in reality. This is a sign to the storekeeper that the price is to be lowered. After some more abuse of the article he will announce that it can be had for seventy cents. The game continues until a balance is struck. Thus manners are symbols well understood and life goes on as smoothly as with us.

The very existence of food taboos and regulations, all adorned with beliefs, explanations and theories, indicates that food was uppermost in primitive man's mind. It is a constant subject of talk, cause of excitement and humor, of complaints and hopes. A feed to repletion on a captured animal or a feast on some special occasion will be talked about for many weeks after the event, and the promise

of a feast to come will stir excited talk for weeks before. Yet this is no different from the conversation one hears in our own society for several days after Thanksgiving.

For that matter, spend a few days in a country under the heavy yoke of rationing, not that of the narrow scope and generous limits we are as yet enjoying in this country, but true wartime rationing such as Europe is experiencing today. What one is struck by is the amount of time and talk and passion devoted to food, not for the sake of information, but for sheer emotional release. People talk and dream it incessantly. Foods people never cared for, suddenly become most desirable and expensive, as is the case with onions in England.

It is precisely because food was uppermost in primitive man's mind that it penetrated his religion, his social conduct, his mourning and celebration, his ritual and courtship, his loyalties and fears. Because it was uppermost in his mind he tried to theorize about it, explain and understand it. In this manner it penetrated primitive science just as much as it does modern science. The end result is, of course, quite different. Ancient man's science seems crude to us, worm-eaten by wishful thinking, anthropomorphic sentiments and fears, subjectivity and naïve assumptions. Yet these evil influences have not totally perished, and still plague us to some extent. As in every other respect the differences are of degree and not of kind.

And so, because food filled his thoughts, primitive man created many beliefs and theories. Each one of them led to what we call today a superstition or a prejudice. Yet these explanations were worthy attempts at science, still in its infancy.

Small indeed is the number of practices for which man cannot readily produce an explanation. These are often as far from reality as the imagination can wander. The mind, it seems, hates a vacuum and readily locates a satisfactory explanation which seems so reasonable and sensible as not even to require critical verification.

Man always had a reason for each practice just as we have many of them ready at hand in defense of our own habits. An American tourist in France, Switzerland or elsewhere in Europe where horsemeat is eaten, can easily perform the following experiment. Offer

a friend a steak of horsemeat without previous warning, let him in on the secret after he consumes all or part of it and, in all likelihood, he will feel sick and cite as many reasons against eating horsemeat as Mohammedans, Jews, Micronesians and others will offer against pork, Hindus against beef and many Bantu tribes against the hen and her eggs.

And this is where the significance of a study of human food habits lies. It is not their peculiarity or diversity that count but the lesson they convey. And that lesson is most relevant in our present situation, the keynote of which is to change our own food habits in accordance with a pattern dictated by science.

This, we all know, is easier said than done for reasons now fairly apparent. As has been amply demonstrated, food with man is not just food. It is the crossroads of emotion, religion, tradition, and habit. That to which we are accustomed seems natural, while the strange seems unnatural and undesirable.

Condition a child to speak a particular language, and his mind, his ears, the muscles of his larynx and mouth find that language simple and natural. Change is laborious then, and seems such an unnecessary evil. The same is true of food. When brought up on beef and pork, we will not readily give these up for some other source of meat such as horsemeat, snake or rabbit, whatever the reason. People accustomed to coffee will not cheerfully exchange it for milk or tea. Even the most scientific among us possess the same feelings of aversion toward strange, unaccepted food as is displayed by Mohammedans to pork or by Hindus to beef. A person fully trained in anthropology and biochemistry may well share a meal of earthworm patties with some natives, enjoy his courage while it lasts and gain the respect of his hosts for being a sport. Yet after awhile a nausea sets in, a regret made doubly annoying because what happened is irrevocable. And this case is not unique. A young lady and her fiance, both biologists familiar with animals, proteins, and digestion were out on a field trip. A caterpillar fell on the girl's blouse. Scientist or not, she was frightened. Her friend removed the larva, laughed at her reaction and to prove it was only protein, ate it. Though his

science and logic were both sound, the engagement was broken. The female scientist declared she could not kiss a wormeater. This is no different from the attitude of primitives. Mohammedans and Jews feel they annihilate another person by calling him a porkeater or an uncircumcised one. Similarly, tribes that file or saw off their teeth as a matter of ritual believe they drown Europeans in a flood of contempt by dubbing them the flat-teethed ones, or the ones with a mouthful of teeth. It is indeed amazing how human all people are, regardless of their level of learning or form of social development which we often call civilization.

The scientist who studies the effect of food on animals gains a very clearcut picture of the role of nutrition in health and disease. By properly regulated diets abnormal individuals can be produced within a few weeks and the effect of malnutrition dramatically demonstrated. Equally dramatic can the recovery be. Within a few days after the previously deprived vitamin is added to the diet, blind, crippled and decrepit individuals regain normal vigor as if by incredible magic.

The same can, of course, be observed in human beings, as the quotation from Williams previously cited so clearly illustrates. Similarly amazing recoveries are obtained in cases of pellagra, rickets, scurvy and the type of blindness, known as xerophthalmia. Many of these diseases seemed in the past to behave like plagues. The absence of a particular essential food in a certain region or the seasonal shortage of a basic food item struck the entire population. The gradual spread of the affliction then made it rightly appear to be a plague. These were feared just as much as we today fear typhus, influenza, infantile paralysis or cholera. Sound nutrition has made the occurrence of mass clinical malnutrition well-nigh preventable.

But that does not mean that subclinical malnutrition has ceased to exist. On the contrary, it persists in our population precisely because its expression is subclinical, by which is meant that it is below that level which demands immediate clinical attention. The individual is most often unaware of the damage. He is in the posi-

tion of someone born without a sense of pain. Pain is, of course, a beneficial biological adjustment. It serves to notify the individual that something is amiss which requires immediate attention. In the absence of a sense of pain, the cause of the disturbance is allowed to persist and expand. Subclinical effects of malnutrition do not bring pressure upon the individual. Their detection is not always easy though their consequences may become apparent when it is too late.

It is no wonder then that, knowing all this, the nutritional scientist is simply dumbfounded when he is confronted with human reluctance to accept all the new findings of his science, with people's reckless gambling with their own health and that of their children. He is doubly bewildered because he cannot reconcile this reluctance with the belief held by most contemporaries that people invariably act in self-interest. Why then do they not do so here?

The answer to the query lies in the study of man and his nature. As we have seen, food habits are linked with so many emotional bonds that though something in man may be willing, potent forces also lodged in him will hold him back. The same is true of the reception accorded so far to Christ's message. Surely, it rings a receptive note in men everywhere. But that does not mean that it can readily be put into practice. Something in us intrigues against it. Man's worst enemy is his nature or rather some aspects of it. While some component of his nature is sufficiently noble, farsighted and sensitive to understand and cherish the message, there seems to be another side which casts obstacles in the way.

The same is true in nutrition. It is human power and ingenuity that brought man to the conquest of the dread beriberi, of the curse of scurvy, the misery of rickets, pellagra and other scourges. Yet, that same man will foolishly persist in his slavery to habit, complacency, rationalization and folklore.

Primitive man, too, was not all superstition and taboo. Some of his dietary conquests were as ingenious and brilliant as the achievements of the modern scientists. Most of our food of today and the means of preparing it are, after all, his contribution. It is he who found most of our fruits and vegetables, cereals, grain, bread, wine

and the birds and animals we eat today. But particularly revealing is the case of manioc.

Manioc is a poisonous plant. The primitive Indians of South America originally used its poison, which they extracted and employed in fishing and for poisoning their arrows. The fish narcotized by the drug thrown into a pool or lake would rise to the surface and be readily gathered. At first, the starchy material left after the extraction of the poison was discarded. Later it was discovered that it made a good starchy meal and could be used as flour. In the course of time the manioc plant became the people's staple although its poison was no longer used. The plant was washed thoroughly in water, the poison dissolved or leeched out and discarded and the remaining starch used for their daily bread.

Such instances could be multiplied many fold. We are not dealing with the stupidity of a species but with a certain psychological state of man which is not affected or changed by condemnation or abuse. Only a scientific study and approach can change it because knowledge can be power, and failure stems either from ignorance or incompetence. Knowledge can overpower even the seemingly impossible. Man's worst enemy is man himself, his nature, his habits, his beliefs and practices. Only knowledge of man can teach us to change him in the direction of a goal based upon science.

Nor must it be assumed that primitive man failed to suspect the role of food in general, and of certain specific items in particular, in matters of health and disease. On the contrary, from earliest days down to our own, man has felt that there is something in what he consumes which merges intimately with him, and which can do certain things to him. In fact, medieval magic operated on this basis when it took for granted that the sorcerer gained full power over a person by getting possession of a remnant of his food. The act of collecting crumbs or remnants was sufficient evidence to condemn thousands of women to be burned at the stake as witches.

Strangely enough, almost every vegetable or animal tissue enjoyed a limited reputation for medicinal powers of some sort. The connection between the vegetable or animal organ and the disease

it cured was often most fanciful. Few of them proved to be sound in the light of scientific examination. But even medical folklore of antiquity endowed each plant with magically curative power. The yellow dandelion was thought to cure jaundice and red roses the pallor of anemia. Blood, too, was believed to be a cure for anemia which proved a pretty good guess, one of the few bull's eyes among thousands of blind guesses. The stranger the plant, the more magic human fancy attributed to it. Any resemblance of the plant to the symptoms of the disease was exploited for concocting a connection between the two.

With animal organs the case was somewhat different. Each organ was believed to be the seat of some quality and the consumption of a particular organ was thought to impart its specific virtues. Thus, eating an enemy's heart bestowed upon one his courage, eating a leg of a deer made one a fast runner. For some reason, the excreta of crocodiles and such bodies as gall stones were believed to be particularly powerful cures in the middle ages, and only three hundred years ago small pieces commanded as much as fifty thousand dollars. Medicine men of the past, like doctors of today, often employed plant and animal extracts in their treatments. The primitives differentiated little between using a medicine internally and externally. If a substance had medicinal powers, it was believed it would cure equally well one way as the other.

We see, then, that even our notion of food as a cure for disease was not unknown to primitive man though he arrived at it in his own hard and clumsy way. Modern science uses different methods and more trustworthy procedures. Yet it is important to bear in mind that in the battle for improvement of human welfare waged in the past, resistance to novelty in man and society, general complacency and nearsightedness, blind belief and rationalization were as common and as human as they are today. When we laugh at and condemn primitive man, we laugh at and condemn ourselves. Much progress, no doubt, has been made but we still have much to improve in the nature of man and his society, and much to learn.

Chapter III

Food and the Health of Populations

Man is a believing animal, avid for faith and hope. He wants to believe regardless of whether he is, as we are wont to say, steeped in superstition, or leaning upon the solid rock of science. On the contrary, he will, whenever possible, exploit his science to gain his much needed belief. When the religious life-blood stemming from the middle ages ebbed toward the nineteenth century, man's creed shifted to science, mechanism, reason and progress, all valuable concepts but accepted by most people with the same blind finality that they bestowed upon the very beliefs these concepts replaced.

The same is true in more prescribed and specific sciences. When conditioned reflexes first became known they were used immediately in a bold attempt to explain all of human conduct. Their rule was, however, soon challenged by the psychoanalytic wave of complexes and the subconscious. No sooner were these entrenched safely on their throne than genes and "all is heredity" became the slogan. That too was short lived and the lovers of complete and one-track explanations made a run for glands and hormones and finally vitamins.

If we are really concerned with changing the eating habits of humanity in harmony with science so as to give mankind the optimum of health, we must guard against false and harmful exaggeration. Let us not promise that you will grow to be a giant if you eat right; that you will not lose your hair or suffer from cold; that you will never get sick or die prematurely and the like. We must be scientific and reserved and state only what we know. The role of food in the health and welfare of human and animal

populations is so clearcut as not to need any propagandistic and childish overstatements.

Several interesting studies of comparative diets in human groups and corresponding differences in their physique and health have appeared in recent years. One of the most outstanding is the study by Orr and Gilks of two African tribes, the Kikuyu and Masai. The Kikuyu are agriculturists, living on a diet chiefly vegetarian. Meat is eaten very rarely. Milk is drunk very little and is forbidden to females from puberty to menopause. The diet consists of tubers, cereals, plantains, legumes, and green leaves. The cereals are maize or millet. The diet of males differs from that of females, the latter eating more green leaves. The diet of the Masai, on the other hand, consists of fish, milk, and the flesh of domestic animals with some addition of berries, roots and bark. Maize meal has been added only recently. Generally speaking, it must be admitted that the diets of both groups are inadequate, although that of the Masai is far superior to that of the Kikuyu. The Masai grow more rapidly, and at the age of 20 are, on the average, 5 inches taller than the Kikuyu. At the same age Masai males are 25 lbs. heavier than Kikuyu males and the Masai females are 29 lbs. heavier than the Kikuyu females. Premature senility is common in both tribes. As regards comparative strength, the Masai male is superior to the Kikuyu by 30 lbs. Even the Masai female is superior to the Kikuyu male. The difference in weight between the two sexes within the Masai tribe is 30 lbs., among the Kikuyu only 10.

It is interesting to note the difference in physique between the Masai boys living at their own homes and those living at the government schools. The diet they receive at the mixed government schools approximates the Kikuyu diet. While the Masai boys living at home are in very good condition, the school boys approximate the condition of Kikuyu boys. The physique of the mature Masai is good, while that of the Kikuyu is very bad. The Masai are usually fit warriors, while of 17,000 Kikuyu recruited for the military services (in 1914–18), 11,000 were immediately rejected on medical grounds. Subsequently, 17% of the remainder were rejected as well. Death

rates from various diseases are much higher among the Kikuyu than the Masai, although the incidence of venereal diseases is higher among the Masai and fertility higher among the Kikuyu.

The diet of Masai women is inferior to that of the men, and their physique is correspondingly inferior. The same is true of the relations of the two sexes among the Kikuyu. The Kikuyu male shows a physique and strength comparable to that of the Masai women, while that of the Kikuyu women is the lowest of the groups. The capacity for work goes hand in hand with the diet of these various groups.

A comparison between these two tribes and the physique of Europeans shows that the health of even the best of the African groups, namely, of the Masai males, is inferior to that of average Englishmen. Corresponding results were obtained in the incidences of disease in these various groups. The Kikuyu diet which is rich in carbohydrates but deficient in calcium and protein, correlates with susceptibility of that tribe to certain ailments, such as tropical ulcer, bone deformities of various kinds, anemia, spongy gums, and other diseases, while the Masai population suffers little from these diseases but has a high occurrence of chronic constipation and arthritis. The two tribes even show differences in prevalence of worm infection.

Studies of hospital and prison diets indicate that most of the deficiencies and the inferiority in physique and health could be overcome by improvement in diet. As unsatisfactory as the African prison diet may seem to us, the fact that some thought is given to it has dramatic consequences. Prisoners weigh on the average 10 lbs. more than the general population, feel better, are more efficient workers and have lower incidence of common diseases.

Large scale studies of a similar type were also conducted in India by Major General R. McCarrison. The Indian population presents excellent material for dietary studies because of its diversity in food habits and traditions, as well as geographic and climatic locations. Their staple article of diet is some kind of cereal, such as wheat, barley, maize, or rice, and often a mixture of some or all of these. It is interesting to note that the nutrient value of these cereals dif-

fers widely according to locality. Some millet grown in the south of India is very low in Vitamin B_1, and so are some legumes. This depends in all likelihood upon the genetic stock and the conditions of the soil, manure and irrigation. This study indicates that as the nutritive values of the national diets fall there is a corresponding decline in stature, body weight, stamina, and efficiency of the people. "Groups of young rats, 20 in each, were fed on certain national diets of India, care being taken to simulate in every detail the culinary practices of the races concerned. The animals were obtained from the same stock—an unusually healthy one. The experiment was so conducted that factors such as climate, atmospheric temperature, rainfall, age, body-weight, sex-distribution, caging, housing, and hygiene were the same in all groups. It was found that the nutritive values of these diets—as determined by the average body weight of each group at the conclusion of the experiment—ranged themselves in the following order:

Diet	*Average body-weight of Group*
Sikh	235 grams
Pathan	230 "
Maharatta	225 "
Kanarese	185 "
Bengali	180 "
Madrassi	155 "

The figures obtained from this experiment correspond closely with the physique of the various tribes whose diets were fed to the rats. The investigator concludes that the diet of whole cereal grains, or a mixture of whole cereals, milk or its products, legumes, root vegetables, fruit, and water, with meat occasionally, produces the optimum health.

Sir John Orr has also conducted controlled experiments on rats which were fed diets corresponding to those of the low and high income groups. One group was given a poor diet and a second related group had this diet well supplemented. The difference in weight of

these two groups was most impressive. The mortality in the poorly fed group was 54.3%, while in the group obtaining supplementary food it was only 11.6%.

Another fairly new aspect of relevance to proper nutrition and public health is brought out by a series of experiments proving, it would seem to indicate, that animals raised on a well-balanced diet show resistance to various virus and bacterial diseases not normally linked to dietary deficiencies. No doubt many other factors are implicated, but the experiments on birds and monkeys subjected to the above diseases show a primary nutritional influence in these diseases. Evidence is accumulating daily to indicate a similar relationship in human health. All studies on the diets and the diseases of African and other under-developed nations indicate the same phenomenon which Sir John Orr found among the Kikuyu, namely, the relationship between diet and the prevalence of certain diseases. For example, tribes depending on a rice diet show a frequent occurrence of respiratory, gastro-intestinal, and skin diseases, and malnutritional oedema. For that matter similar results are observed among wheat-eating races. Observations have also been made on the greater occurrence of "stone" among cereal-eating nations. Similarly peptic ulcer has been shown to be correlated with a tapioca diet in India, as for example, in the district of Travancore, while the Sikhs, subsisting on the lacto-vegetarian diet, are free from such a menace.

More recently a dietary survey was made of another native tribe known as the Bemba. The Bemba, like most African tribes, subsist largely on carbohydrates, especially millet, and suffer from protein shortage. Chemical analysis of the diet showed, however, abundance of calcium, while the Kikuyu, studied by Orr and Gilks, and whose staple was also millet, showed distinct calcium deficiency and all its harmful effects on physique. The Bemba were, as expected, physically superior to the Kikuyu. A comparison of the two millets showed them to be different species. The finger millet of the Bemba contains 0.32% calcium, while the white millet of the Kikuyu contains only 0.02%. How much of it is genetic and how much of the difference is accounted for by the soil is impossible to determine at present.

But then heredity cannot be separated from environment, but rather are both linked in interaction.

Hence, just as one must have luck to be born into, let us say a democracy rather than a caste society, so must one be fortunate in being born into a society that by chance, choice or necessity became attached to a staple properly endowed by nature with necessary nutritional components. For that matter, luck is also required not to be born into a society where properly endowed food is traditionally abused by man to his own detriment. Can science master this dictatorship of chance and offer mankind sound nutritional guidance and practices?

Numerous studies and surveys conducted in this country indicate the poor eating habits of our own population. That poverty is a significant cause of national malnutrition hardly needs to be mentioned. Though the percentage is much smaller than the mythical, and by now classical third, it is still a blot on our national escutcheon which is, however, being slowly eradicated. What is of immediate interest is that between 80% and 90% of our malnourished population actually would have the means of obtaining a good diet were their eating habits dictated by science. This in no way implies that they would have to eat any item whatever which does not suit their taste. And yet poverty, ignorance and indifference continue to undermine not only the health of the present population but also of the generations to come.

Sir John Orr's study on the income, health and diet of the population of England presents excellent material on the subject. In this study the population of England is divided into six groups on the basis of income. It is then found that the bulk of the population of this nation, which is one of the wealthiest, most advanced and best governed in the world, is malnourished, and that whenever dietary qualities, amounts and customs are improved, the health and physique of the population dramatically change for the better.

Among the lower income groups and those with bad eating habits the height of children and adolescents is several inches lower than in the well-fed groups. The occurrence not only of deficiency dis-

eases but even non-dietary infections, and the incidence of tuberculosis in adults and anemia in pregnant women, are much higher than in the higher income and well-fed groups. Figures for the United States show that when family income for half a month is under six dollars there is sickness at any particular time in 70 cases per 1,000 individuals, with 5.9% of working days lost. With half-monthly income from six to eight dollars there are 48 cases per 1,000 with 3.6% of working days lost. When the income amounts to ten dollars and over, the sickness rate is 18.5 per 1,000 with only 2.3% of days lost.

How diet affects the mother and child can be seen from some recently performed experiments. A group of pregnant women whose diet was described as poor was not tampered with. Another group was given supplementary food to assure them a fairly good diet. This consisted of milk, eggs, oranges, canned tomatoes, cheese and vitamin D capsules. A third group of well-to-do expectant mothers were instructed in proper dietary practices and were observed for comparison. The results are most informative. Obstetricians who knew nothing of the dietary experiment then rated the course of pregnancy of the women in the different groups. In the first one they found 66% good or excellent. In the second 95% and in the third 85%. In the poor diet group there were 28.6% of anemia cases during the prenatal period, 6% miscarriages and 8% premature births. In the group given supplementary diets the corresponding figures were 16.1%, 0%, and 2.2%, while in the third instructed group the figures were 21.6%, 1.2% and 3.2%. Similar differences were noted in the occurrence of inflammation during convalescence.

Equally impressive was the rating given by attending physicians to the newborn infants.

	Children rated			
	Good	*Fair*	*Poor*	*Bad*
Mothers on poor diet	62.3%	23.7%	5.3%	8.7%
Mothers on supplemental diet	90.5%	9.5%	0 %	0 %
Mothers on good diet (given advice only)	72.2%	23.8%	1.2%	3.0%

Similar results were obtained for the ability of the mother to nurse the child at the hospital and for the incidence of illness in the infant from birth to six months of age. This evidence indicates that the mothers of the low income group given supplemental food amounting to less than fifty cents' worth weekly did far better than the wealthy mothers whose diet was classified as fairly good to begin with but who were given only dietary advice. This fact should be given much thought by nutritionists and educators.

The effects of wartime food shortage upon children is significant. Children born in Berlin in 1913 were, upon entering school in 1925, 2 to 1½ inches smaller and 2 to 3 lbs. lighter than those who entered school in 1933. The difference was even greater for children leaving school at ages 13 to 14; it was from 2½ to 3¼ inches in height and from 8 to 12 lbs. in weight. In Leipzig the average height of boys increased 3½ inches and that of girls 4½ inches from 1918 to 1933.

Another series of experiments performed in London is of interest. In a boys' home a gain of 7 lbs. in weight and 2.63 inches in height in a year was recorded for boys who received a pint and a half of milk daily in addition to the ordinary diet. Those not receiving the additional milk gained only 3.9 lbs. and 1.84 inches during the same period. Similar experiments with milk given twice daily in Paris to school children for six months resulted in a 40% extra gain in weight for boys and 65% for girls, as compared with children who had not received additional milk. Similar experiments have been conducted in Japan, New Zealand, Norway, Scotland, the United States, and elsewhere.

In most countries which have military conscription, records have been kept of the health and physique of young men reaching the age of service. These data show the usual upward trend and a consistent increase in height with the advent of years and greater height and better physique for the better-fed groups. Thus in Sweden the average stature increased between 1840 and 1926 by over three inches; in Denmark the same increase took place between 1840 and 1913; in Norway the increase was four inches between 1800 and

1900; and in the Netherlands about 5 inches between 1850 and 1907. This trend still continues and "the stature of the first ten thousand American draftees in the present war is three-quarters of an inch above that record for 1917–18."

Generally speaking, wherever the feeding of the population improves there is immediate improvement in health and longevity, there is a sharp fall in maternal and infant mortality, in stillbirths, and the incidence of even many non-nutritional diseases. The population size shows sudden and continued increase and the general health and productivity of populations improve as well. It goes without saying that numerous other factors play important roles in these phenomena, such as sanitation, economic betterment of labor, hygiene, and the rapid progress in medicine and surgery. Nutrition undoubtedly plays a vital role in these social trends of improvement in physical wellbeing.

But the world is still far removed from an economically safe and scientifically adequate diet. The bulk of humanity is still living on a diet far too rich in carbohydrate and far too low in protein. This is of special importance in wartime. Recent experiments indicate that an adequate protein diet is essential to the organism's production of antibodies which provide immunity to disease. It has been suggested that the outbreak of plagues during and after periods of war is due to lack of protein invariably connected with war economy. The lack of protein in the diet weakens immunity and enables the plagues to advance.

As has already been indicated, humanity's food problem is not an exclusively economic one. As the story of man's food unfolds we shall see more and more of the other factors involved. In the last chapter of this volume a suggestion is offered for the people to consider which might help to solve some of the economic, as well as the psychologic, difficulties.

Chapter IV

Remember the Food Groups

Primitive man, like the majority of our contemporaries, identified the satisfaction of hunger with filling the stomach to the brim. A good, satisfying meal meant one at the termination of which you simply could eat no more. It goes without saying that quality was also of primary concern. The statement commonly heard today, "I know what I like and I want plenty of it," was equally true thousands of years ago.

It is precisely such incidents which make us question the common belief that people are motivated only by self-interest and invariably act to their advantage. We are made to see again and again that even in such a biological sphere as food, people act on the basis of belief, habit and the dictates of social prestige. But the scientist does not have to go very far to observe that even when left to taste and so-called instinct, the natural course man follows may be not only disadvantageous but even downright harmful to him. If nature were really so kind and forever leading us wisely forward, would so many of our people have nutritional deficiencies? Would men fight to lose their lives for the possible gain of an uncertain economic trifle by comparison? Would so many nations perish and would human history be so full of folly, cruelty and destruction? And does not really he who fights by the sword die by the sword; and will not the leaders of aggressor nations ultimately lead their people to ruin?

Not only do people often act with stubborn self-justification in a way strongly detrimental or even fatal to themselves in ordinary practical affairs, but they do the same in social and spiritual spheres. We all know the egotist, the braggart, the snob, the miser or the bore. Like most people, they want friends and recognition, some

social warmth and kindness. But they are shunned and ostracized and are often unhappy. Why do they act the way they do, and persist in it even after they are told the cause of the popular disapproval of their conduct? Perhaps it is some force in their biological or psychological constitution which impels them to behave in that specific manner and they are not strong enough to control it.

Any spiritual leader is familiar with human beings who persist in their evil ways and incur presumably eternal retribution in a life to come. Moreover, the victims themselves believe in punishment in the future world and transgress, nonetheless, in the eyes of the Lord whom they fear. Do religious leaders believe that people act always wisely for their own benefit?

Yet, neither nature nor man is always contrary. Nature is full of amazing and miraculous adjustments. The very phenomenon of life implies the existence of millions of delicately balanced functions, each of which is provided with an automatic governor which checks excesses and restores life-sustaining balance. Consider only one instance such as the flow of our blood through the tissues of the body to obtain its oxygen load in the lungs and deliver it to every cell. Here are literally thousands of balanced systems and "coincidences" of which we are never aware but which maintain our life.

Should our blood get somewhat more acid than normal, as it does after heavy exercise, the increased acidity stimulates a part of the brain known as the respiratory center. When thus stimulated, this area causes more rapid breathing which forces out more carbon dioxide from the lungs and thus brings about elimination of much excess acid. Should the blood get somewhat more alkaline than normal, as it may after a heavy fresh vegetable diet, then the kidney is called into action, acid is retained to neutralize the alkali and its excess is also forced out into the urine. These are only observable events. But inside the body, in the realm of hidden chemical reactions, nothing but harmonious organization, compensations and adjustments prevail.

While the body is full of such delicate and practically miracu-

lous adjustments, nature can be equally casual and unconcerned. For this reason it is futile to declare that nature is either all this or all that. Only knowledge and understanding translated into action can help us control our biological fate. Similarly, only love of freedom and democracy translated into action can preserve our independence.

Even early nutritional science erred in the same direction as did primitive man, thus proving that even science advances only one step at a time. Late in the nineteenth century, it was discovered that all foods could be expressed in terms of energy. Physics and mechanics were then uppermost in people's minds and biologists thought of an animal as merely an engine, which, of course, it is *in part.* This man-machine philosophy viewed all food as nothing but the source of animal heat, as is fuel to a furnace. Consequently, all food was expressed in terms of the calorie, which is the unit of heat, regardless of the nature of the food. Every meal was judged in terms of the calories it supplied and so long as the individual obtained the number required for his daily activities, the scientist felt his nutritional obligations were well fulfilled.

The scientists of that time, a mere thirty years ago, saw only part of the truth. That much we are certain of today. We have learned in the course of these thirty years that foods contain something more than calorific power. They contain different vitamins of which there are quite a number and which are chemical bodies present in foods in very minute concentrations, yet indispensable for proper functioning of the vital organs of the body and for life itself. These substances have already been compared to the fuses in a complex electrical system of lights, bells and switches, each of which controls some important function. They all have their proper chemical names although they are more popularly known by alphabetical symbols such as vitamins A, B_1, B_2, B_6, C, D, E, and K, given to them before their chemical nature was known.

For practical purposes it is more important to know foods and their virtues than to memorize vitamins, their chemical names or letters. It is food habits we are concerned with rather than memori-

zation of chemical terms; practices rather than study of homework to display erudition.

Most of our own notions of foods came to us by way of habit and experience rather than study. For example, we know what a typically good dinner or a banquet is composed of without ever having taken time off to memorize it. We know that such a dinner may start with a toast, surely with some fruit or tomato juice, followed by soup with biscuits, a fresh vegetable salad on the side with oil and vinegar, olives, pickles and celery, meat with cooked vegetables and potatoes, dessert of, let us say, pie a la mode and coffee, cream and sugar. Rolls or muffins and butter, salt, pepper and water are taken for granted.

Now all foods can be divided into several groups in such a manner that a daily consumption of one or two helpings of each can fully satisfy all the body's nutritional requirements. The energy contents of foods do not normally cause much concern because, whether we are aware of it or not, we invariably manage more often than not to satisfy the body's need for fuel. More important to us is probably the task of balancing our diet so that it contains the proper ratios of starch, fat, protein and carbohydrate. However, the primary consideration of the division into these groups has been a consideration of the mineral, vitamin and chemical composition of each.

It is our main purpose to see to it that every man, woman, and young person remembers these food groups just as naturally and easily as we all remember the courses at a banquet. Surely the food groups to be described are no more complex or difficult to remember. The task can be made easier than one thinks after we discuss each group, its meaning, history, its role in health and its place in our diet.

Chapter V

Citrus Fruit, Cabbage, Tomatoes and Other Vegetables

It has practically become a national institution in this country to start our breakfast with an orange, a grapefruit, canned or fresh citrus juices or tomato juice. This desirable food habit has spread very rapidly so that even the immigrants to our shores, young and old, adopt it with great speed. There may be something in these fruits and their juices which appeals widely to the human palate and which has won them such popular favor. The orange enjoys, besides, a romantic glamour of affluence and prestige, especially in the dreams and fancies of Europe's poor. We in the United States are extremely fortunate in having a native all-year-round supply of fresh oranges, grapefruit, lemons and tomatoes so as to make the price accessible to the widest public at all times.

And so we take our orange juice in the morning and give the matter no further thought. It never occurs to us that being deprived of it, or of other fruit or vegetables which could legitimately act as substitutes, would play havoc with our health and literally make cripples of our bodies. The value of these fruits and vegetables lies not in their contents of calories for fuel but wholly in their possession of small quantities of vitamin C or ascorbic acid. We shall record in a few pages the price humanity paid for ignorance of this simple fact in the lives and sufferings of hundreds of thousands of victims.

In the middle ages few vegetables were eaten at any time and fruit was used sparingly even in season. Neither was considered substantial food. Incidentally, many people still look upon them today as relishes rather than essential nourishment. The small

amounts of fruit consumed in the summer was of some value. But after the winter months, during which practically no garden produce was consumed and people lived chiefly on bread and salted or pickled meat, signs of scurvy began to appear in large sections of the population. Swollen and bleeding gums, loosened teeth, blood vessels bursting under the skin and a general lack of appetite and laziness were very common in early spring and were usually accepted as the equivalent of our modern spring fever.

The sixteenth century was the golden age of great voyages. We thrill to the adventures of the famous navigators and discoverers before and after Columbus and we read with anxiety all their daring exploits. Few of us know, however, that Vasco da Gama lost one hundred men out of a total crew of 160 on his voyage around the Cape of Good Hope, or that Magellan's men were decimated by scurvy, and "their gummes grew so over their teeth, that they died miserably for hunger." Sir Richard Hawkins, the famous captain and explorer, writes in his diary "for in twentie yeeres, (since I have used the sea) I dare take upon me, to give account of ten thousand men consumed with this disease."

Those beautiful ships that spelled power, daring and speed under full sail, started out on their journey with brave and strong men. Yet they were at the mercy of winds and many months would pass before land was sighted and stocks could be replenished. They had few fruits or vegetables to begin with. Sixteenth century records are unanimous in stating that the proper victuals with which to provide a ship before setting sail were "Beefe, Porke, Bisket and Sider." Some greens and fruit might have gotten aboard as seasoning but these were insufficient to provide the body with that vitamin C which they possess and which is so essential for health.

After three months out of port, the schooners became death traps; floating coffins in which erstwhile healthy men were slowly and mercilessly dragged into a state of physical decay, a prologue to death. Scurvy stalked the decks and hung over the ships more persistently and ominously than did the legendary albatross over the ship of the ancient mariner. Some with exceptional constitutions,

who probably had stored enough of that fruit and vegetable vitamin, survived the ordeal. The majority succumbed. The disease was the dread of all seafarers and captains, of sailors and the traders with the Indies. As late as 1780, Admiral Sir Thomas Pasley wrote, "Of all disorders this at sea is the worst; once taken, no shadow of hopes of their recovery and returning to their duty, till Land, Air and Vegetable Refreshments can be produced."

The cause of the disease baffled doctors, laymen and naval authorities. "Change of aire in untemperate climates," concluded Sir Richard Hawkins. The influence of sea air, too much salt meat, the change in habits of life, said others. Holland was at that time not only a great seagoing power, but also the center of intense medical learning. Dutch physicians were thoroughly familiar with the scourge, but they ascribed it to "overflowing of black bile," "obstruction of the spleen," or "corruption of the humours."

The great physicians of England also studied the disease assiduously. Their explanations were no nearer the truth. "Unwholesome air," said some, caused by the fact that, "the sea is natural for fishes and the land for men." "A vitiated texture of the blood," said others. Many thought it infective and it was universally called a putrid fever. Those afflicted with it did emanate a horrible odor that many witnesses attest reeked for miles around a stricken ship. It was also believed that sea-scurvy differed from land-scurvy, no doubt because it was severer.

The remedies were as varied and as imaginative as the postulated causes. Some physicians prescribed, "Excellent purging Pills" which "cure the Scurvy, the worst reigning Disease in This Kingdom." Others, blaming the disease on laziness, in reality one of its symptoms, prescribed hard work. A popular remedy was vinegar and dilute oil of vitriol (sulphuric acid).

Yet, amazingly enough, throughout the entire period of the ravages of scurvy, it is possible to find a few individuals here and there, captains, sailors, adventurers, as well as obscure ship doctors and native medicine-men who advanced the belief, substantiated by numerous cases, that fresh herbs, grass and fruits, especially lemons,

were effective cures. An English explorer who argued stubbornly that the disease was due to sea air and was cured by land air wrote nevertheless of "soure Oranges and Lemons" as follows: "This is a wonderful secret of the power and wisdome of God, that hath hidden so great and unknowne vertue in this fruit, to be a certaine remedy for this infirmity." Besides these fruits, many knew that garden cresses called scurvy grass were a good cure for it though the plants were often boiled, thus destroying most of the vitamin. Some sailors knew that many grasses and green leaves were beneficial, but in time the fame of the medicinal power of oranges and lemons gained in vigor. Some ships began using concentrated juices of these fruits which they converted into a syrup by evaporating the juice over the fire, which process, no doubt, made it worthless.

We find, however, that in the year 1600 A.D. four ships chartered by the newly formed East India Company left Woolwich, England, under the command of Master James Lancaster for the East Indies. After a few months at sea, "very many of our men had fallen sicke of the Scurvy," on three of the ships. The Commander's ship had practically no cases.

"And the reason why the General's men stood better in health than the men of other ships was this: he brought to sea with him certaine Bottles of the Juice of Limons, which he gave to each one, as long as it would last three spoonfuls every morning fasting; not suffering them to eate anything after it till noone. This Juice worketh much the better, if the partie keepe a short Dyet and wholly refraine salt meate, which salt meate and long being at See is the only cause of the breeding of this Disease."

We see here how slowly and how painfully man actually makes progress. The right practice was laboriously followed, while the old belief in the cause of the disease was still maintained. Apparently, belief in a false theory need not always imply bad practice.

After this experience, the East India Company arranged for a supply of lemon juice for all its ships. It goes without saying that the dreaded scurvy vanished as if by magic. But that does not mean that other shipping companies, doctors or sailors followed suit. In

1610, one of the ships plying the seas for the East India Company met a Dutchman far from shore.

"The eight and twentieth, in the morning, the wind being westerly, and reasonable faire weather, we steered with the Dutch. . . . He told us, that he had but eight or nine men standing, the rest sicke, and sixe and forty dead. A grievous chastisement unto them and to us a never sufficiently acknowledged mercy: that they who offered to spare me ten or twenty men, or more upon occasion, *should so generally decay, and we lose no one, nay every one in good health.*"

In spite of this clearcut experiment, John Woodall, the surgeon for the East India Company, felt certain in 1612 that the disease was due to sea air and salt meat and "want of wine, beere or other good water to comfort and warm their stomaches." Yet, he thought that grasses and especially citrus fruits were ordained by God to cure this disease. "The use of the juyce of Lemons is a precious medicine and well tried, being sound and good, let it have the chiefe place for it will deserve it." But he also believed that oil of vitriol was "an especially good medicine in the cure of scurvy." We know today that it is not. Strangely winding and crisscrossing are the roads to truth. In addition, it was believed for centuries that oranges and lemons were good for curing the disease at sea but only scurvy grass or other cresses should be used on land.

It was also maintained that the curative action of scurvy grass was "occult and secret, as almost all modern Physitians do agree." The curative principle was a "volatile salt of a certain bitterish taste" which acted upon and destroyed "the crass and fixed salt" in which the "scorbutick humour abounds" and which gets into the blood from salt food.

But in spite of the knowledge of the beneficial action of citrus fruits and grasses, land scurvy remained a dreaded scourge. As late as 1766, it is still referred to in an English newspaper as "the reigning disease." A prophetic author wrote then, "If we drank less tea and used gentle acids for the gums and teeth, particularly sour oranges, though we had a less number of French dentists, I fancy this essential part of beauty would be much better preserved."

The truth about the cure of scurvy was already known to some in the seventeenth and eighteenth centuries, and a Dutch physician had published a wonderful treatise to prove that there was no difference between land and sea scurvy, that the disease was due to a lack of fresh vegetables in the diet, and that it was cured only by "fresh herbs, fruits and berries." The author even uses the word, "antiscorbutic," still employed today to designate food which fights scurvy. Yet we find that in the eighteenth century the disease is still rampant on land and sea.

The work of the Dutch physician "did not appear to have made much impression on the medical profession which, for the greater part of the century, continued to argue and wrangle over the cause and character of the disease." Old ideas die hard among professionals as well as laymen, and new truths do not fall easily into humanity's lap. During most of the eighteenth century there was still much groping for other remedies. Some purified the salt with which all meats had to be preserved, others tried all kinds of novel cures and gave elaborate chemical explanations. But on sea and on land, scurvy killed its tens of thousands annually. "During the Seven Years' War 185,000 men were raised for 'sea-service,' of whom no less than 130,000 died from disease." More than two-thirds of these were victims of scurvy.

Throughout this period of search, one physician here and another there stumbled across the truth. But the London College of Physicians and the English Admiralty clung to the old views and were hard to convince. Captain Cook did much to discredit oranges and lemons because, to save deck space, he had boiled the juice down to a small volume and, in this way, killed the vitamin. The concentrate proved ineffective and he concluded that orange juice was no real remedy. He did favor sauerkraut, however.

The Admiralty was in a quandary because of the conflicting views of experts. Finally in 1798, almost two hundred years after Captain Lancaster had definitely proved the curative value of lemon juice on his long voyage to the Indies, the Admiralty ordered each ship to carry fresh lemon juice and issue one ounce daily, mixed with an

ounce and a half of sugar, beginning after the sixth week at sea. Often lime juice was used, hence the name "limies" for British sailors. After awhile, rum was added which tended to preserve the juice. "The result was dramatic. In 1760, there had been 1754 cases of scurvy in the Naval Hospital at Haslar; in 1806 there were none." But it took two hundred years, and the sufferings and deaths of millions.

The disease was liquidated so far as the Navy was concerned. The merchant marine did not introduce the compulsory "lime juice" stipulation until much later when obliged to do so by a ruling of the Board of Trade. But scurvy gained prominence again during the Crimean War when, according to Florence Nightingale's evidence before a Commission of Enquiry, "scurvy had occasioned more loss of life among the British forces than any other cause." While the British were so hard hit, the French were hardly affected. Lord Raglan, the British chief, thought it was the coffee, rice and sugar which the French had in their rations, that protected them. He gave the same to the British forces but saw no decrease in the ravages of the plague. What he failed to observe was that "the French soldiers made use of every available scrap of vegetables in the locality of their camps."

"Even in more modern times," writes a current publication, "when through blockade or siege fresh vegetable foodstuffs have become unobtainable, the disease has been known to ravage whole populations. Half the defending garrison of 17,000 men were found to be stricken with the complaint after the siege of Port Arthur during the Russo-Japanese War, while in the World War of 1914–18, the disease became widely prevalent in Austria. At the present time, apart from privation enforced by war conditions, the disease appears to be most rife among certain backward nations, notably the natives of South Africa and the Aborigines of Central Australia."

In spite of obvious awareness of the role of fresh fruit and vegetables in the cure of scurvy, the disease was attributed for a long time to the action of some actively harmful substance deriving from one source or another. That fresh fruits and vegetables cured

the disease, surprised no one because fruits and herbs were employed in curing practically every disease and ailment under the sun.

The complete revolution in our understanding of this disease and many like it, and in our attitude toward them, came as a result of recent experiments which proved that it is *the absence of something in the diet that produces the diseases rather than the presence of a harmful substance*. This epoch-making discovery has enabled us to prevent any lack of vitamins in our diet, which is a far better procedure than fighting the disease when it bursts forth in its final triumph. Our goal is to prevent its growth. A well-balanced diet means no deficiency diseases.

The last chapter of this battle with a cruel and hideous affliction was the discovery of the actual chemical compound, so abundant in orange and lemon juices and in many fresh vegetables and animal organs. This substance, called ascorbic acid, plays apparently such a fundamental role in the workings of the body that without it disturbances set in, the expression of which we call scurvy. These disturbances are numerous. Inadequate daily intake of ascorbic acid produces deterioration in all fibrous tissues, in bones, cartilage, and teeth and causes rupture of blood vessels, producing bleeding.

The fruit and vegetables we eat are digested in the stomach and small intestine. The vitamin in them goes to our blood stream and is carried by it to all organs, tissues and cells. If there is too little of this substance in the blood, mild and invisible symptoms appear of which we may not be aware but which undermine our health and especially our resistance to infection. On the other hand, when there is excess of the substance, it is simply ejected by the kidney. During colds and infections, large doses of this vitamin have been proved to be beneficial.

We need no longer fear scurvy because usually we get some fresh fruit and vegetables into our diet unless we are fanatical about doing ourselves harm. But that does not free us from the responsibility of giving the matter some consideration. Too little of this vitamin may not send us to the hospital, but it does undermine our resistance and weaken our health. Prevention of these invisible symptoms is

our duty to ourselves, our friends, society and our country, especially in wartime. We will not build good fighting planes and tanks by constructing them sloppily and we will not fulfill our task in the national effort, big or small as that may be, if we treat our own health sloppily. And people have been known to do that.

It must be realized that nobody demands that every person waste his precious time thinking of food, of what he has already eaten, and what he should next put into his stomach in order to fulfill his quota for the day. No doubt many of us have nobler and more important things with which to occupy our minds. But it is precisely to free people from thought and worry and calculations about food that we want good habits to be established so that they might function automatically. Health is then protected with little exertion or effort.

But neither must one be a slave to habit to the extent that one is obliged to get nutritional protection from a single source only. There is a wide enough selection of fruits and vegetables rich in this protective vitamin to please every palate and compensate for any shortage or oversight in provisioning the pantry. Oranges, grapefruit, and tomato juice are not the only source. Most berries, bananas, currants, beans, peas, potatoes and cucumbers are also good sources, and so are such vegetables as cabbage, kale, broccoli, Brussel sprouts, spinach, watercress, dandelion, peppers, green and red, parsley, mustard and turnip greens.

Now, it so happens that the protective substance, vitamin C, is not chemically stable but combines readily with oxygen of the air to become, in chemical language, oxidized. The same occurs when it is boiled for any length of time. And as luck would have it, the oxidized form gives no protection whatever against scurvy. The power is gone. This simple property of vitamin C has not only decided the lives of millions of individuals but has probably sealed the fates of nations. One might say that if that molecule had different properties, our world today would be different. But, of course, this is only a form of speech.

It is a common observation that when an apple is cut, the exposed surface gets red and then turns black. This is even better seen in

potatoes. The process responsible for these changes is called oxidation. While the skin of the apple is intact, nothing happens. As soon as it is punctured, oxygen combines with some substance within and the product becomes colored. In the case of vitamin C, there is no change of color on combining with oxygen but the product loses its physiological potency.

One may, therefore, eat much fruit and vegetables, but if they are wilted or cooked without care and understanding, the body will not get any vitamins from them. As many vegetables should be eaten raw as one can possibly enjoy. Salads have fortunately become fashionable and dinners without them are now rare. Sandwiches without some greens are also disappearing—which is all to the good. But many vegetables do not taste good in the raw state. These must not be rejected, because, with human ingenuity, we may enjoy the preferred taste that comes with cooking and yet save the vitamins as well. Experts agree besides that vegetables, over-cooked to a mushy state, lose their crispness and taste anyhow.

Modern methods of preparing vegetables demand that they be steamed rather than cooked. They are to be placed in a covered pan with less than a quarter of an inch of water at the bottom. It is desirable to add warm water to begin with. The pan is heated for a brief period, the cover is left intact and the contents not stirred at all. Stirring mixes the air and increases the supply of oxygen, thus causing vitamin destruction. In this fashion, the vegetables are merely steamed and somewhat softened, and their taste and protective power preserved.

Those of us who have been conditioned to the taste of vegetables cooked in the old-fashioned destructive way are trapped by a bad habit. We must make an effort to free ourselves from such an obsession lest we pay for it dearly. Wives and mothers must feel as responsible for the health of their families as do nurses for the welfare of their charges. The housewife's role in the life of the family is no longer that of sweat and drudgery. Hers is today the pleasant and scientific duty of managing a home for life, health, education and recreation. Keeping abreast of the sciences of health and sanitation

is more important than keeping up with the Joneses in furniture or gewgaws.

Meat is not a rich source of this vitamin, but such organs of the body as liver or adrenals are well provided with it. When eaten raw, as do some Eskimos, or when only cooked gently, these tissues can supply enough of this protective substance to build a healthy body. But in our mode of life, with our practices and habits, these sources cannot, of course, be relied upon and fresh fruits and vegetables must remain our mainstay.

Chapter VI

Bread and Cereals

Most human groups have developed the custom of a staple food, one that is consumed in considerable quantities at every meal, with additional items serving as relish, delicacy or variety. For centuries bread has occupied that position in our own culture area. In the minds of the people bread became identified with food, and the prayer, "Give us this day our daily bread," truly expressed the people's aspirations for security from hunger. Bread is beginning to lose that status in the United States where for the first time in the history of the world variety and abundance have practically abolished the custom of having a staple food. Nevertheless, bread and flour still occupy a place of honor in our diet, are consumed as toast, buns, crackers, cakes and noodles and usually appear at every meal in one form or another. Besides, there is still a large fraction of the population that retains the old habit of requiring considerable amounts of bread at each meal.

Bread from coarsely ground flour has been found in remains of many Stone Age cultures. Cakes were made in those days of such grains as barley, millet, oats or single-grained wheat. The meal was crude and generally prepared by crushing the kernels between two stones. Our earliest known bread was made from acorns and beechnuts. Some American Indians on the Pacific coast prepared cakes from crushed acorns even in post-Columbian days. This fruit contains a bitter substance which primitive man learned quickly enough to extract and discard. The acorn meal was washed in boiling water for several hours, the bitter-tasting substance was thereby dissolved out and thrown away, while the remaining meal was dried in the sun and baked in its warmth or over a hot fire. Even in Rome in the days of Pliny wheat kernels were pounded and crushed and the product made

into a pulp with water, and baked in the form of cakes in the sun. However, primitive man made much use of hot ashes, burying in them his cakes of dough and obtaining well-baked rolls and bread.

As a rule the primitive housewife was the husbandman, miller and baker all in one. All agricultural work, for that matter, the collecting of wild fruits and roots as well as digging, sowing and harvesting were generally tasks allotted to women. Men hunted, fought or herded the cattle and women looked after the berries of the field, the nuts and fruits of the forest and the edible tubers and roots. In all likelihood most agricultural discoveries, the selection and improvement of plants and vegetables, are feminine contributions. Since taking care of cattle has always been a male prerogative, it is very likely that by the employment of draft animals in agriculture, male labor was drawn into it. Agricultural communities based on male labor are encountered, however, at all times.

Milling and baking were also a woman's tasks and were performed in every household. Grinding stones and ovens are still to be seen in the excavations of every Chaldean home as are the so-called metates and the estufas in the home of every Indian belonging to a corn culture, as in our Southwest or Mexico. Leavened bread obtained by adding remnants of previous dough or by adding yeast to a freshly prepared mixture of flour with water was also known in remote antiquity. The Bible cites unleavened bread which Lot baked when he "made a feast," and orthodox Jews still eat matzoths on Passover. These are biscuits made exclusively of flour and water presumably first prepared by the Jews upon their hurried exit from Egypt under the leadership of Moses. However, the fact that Lot baked unleavened bread on a festive occasion and that it was the customary holiday food of Egypt would indicate that the Hebrews had adopted the popular custom of eating unleavened biscuits on holidays and that it was this tradition rather than the prosaic origin of hurry which was responsible for the Passover matzoths.

Any activity that man indulges in he tends to improve in the course of time, slowly but inevitably. There is an inventive force in man that makes for novelty. Similarly, continuous changes also occur

because the flux of circumstances forever leads to new situations and new arrangements. But inseparably linked with these forces operating to create the novel, there is the conservative force of habit, inertia and acceptance which make us find comfort in the old and reject the new. Progress consists of the reaction between these two trends. Often one trend prevails, often the other dominates the scene. Frequently both forces are of equal strength and the outcome is unpredictable.

Primitive ears of grain were meager in quantity and poor in quality. Equally crude was primitive milling, although it invariably yielded good whole grain flour. Such flour which comes from grain only roughly crushed between two stones contains the starch which constitutes the bulk of the kernel, and the embryo or germ, which is the true seed and out of which grow when it is seeded two shoots, one upward to form the stem and the other downward to form the roots. The starch is merely stored food intended by nature to nourish the growing embryo in its early stages. Coarsely ground wheat also contains the bran, which is the tough outer skin of the grain berry.

Originally, a piece of old dough was retained and used in the making of the new one. This was called leaven and contained the fermenting power. It was soon found that yeast performed the job as well if not more efficiently and it then replaced the leaven. Yeast consists of microscopically small, spherical cells which are alive and can multiply with great speed. They contain substances within them which cause fermentation, that is, the initial chemical conversion of starch into sugar and the subsequent change of sugar into alcohol and carbonic acid gas, or carbon dioxide. The alcohol is very small in quantity and evaporates on baking. The carbonic acid gas forms the bubbles we find in dough, which "rises" and becomes light and fluffy because its volume increases as the acid accumulates due to the action of the yeast. Baking powders are chemicals which contain ready-made carbonic acid gas, thus aiding the dough that offers resistance to the swelling of the gas bubble. Gluten is a protein mixed by nature in small amount with the starch. The gluten absorbs water and forms a sticky, distensible mass. Wheat is so generally

desirable for bread because it contains more gluten than the other grains. Corn, for example, has very little of it and forms a less desirable, less fluffy bread.

The early Egyptians knew not only of leavening but also of the art of making white flour appealing to the eye, pleasing to the taste, probably easy to digest but poor in mineral and vitamin content. The quest for white bread began even then and records indicate that the rich of Egypt indulged in white bread and cakes whenever they could get them. This means apparently that white bread, as happened again in later centuries, became fashionable and was preferred by the populace generally.

All early regulation of bread-making dealt mainly with the weight of the loaf and with the prevention of adulteration of flour. Bakers were subjected to rigid supervision and harassing restrictions in antiquity and in the middle ages. They were treated with great cruelty for the slightest transgression regarding weight or adulteration. They were controlled practically everywhere by the municipality as well as by their own guild which consisted of White or Brown Bakers according to the kind of bread they produced. Offenses were punished by the guild, the government or the mob. Whippings and the pillory were common punishments and "nailing the culprit by his ears to the door-post of his shop" was frequently resorted to. In times of famine when prices rose high, lynchings of bakers were common outlets for public resentment.

But while prices and weights were strictly regulated by king, parliament, municipality or guild, the popular craze for white bread never abated. White bread is obtained from flour resulting from careful milling and grinding of the grain so that the bran is kept out. It is the presence of the bran and the germ which gives color to the flour and subsequently to the bread. The notion prevailed that brown bread was not healthful. "Brown bread . . . having moch branne . . . fylleth the belly with excrements and shortly descendeth from the stomache," writes a sixteenth century author. Contrariwise white bread was considered highly nutritious and was craved by all. There were in the middle ages three kinds of bread—white, brown and

black. The white was prepared from flour free from any bran or germ, brown had some bran in it and black was truly whole meal. The poor of farm and town ate black or brown bread, while the richer classes lived on white exclusively. With the rise in the standard of living during the seventeenth century, the working classes of large cities refused to take anything but white bread except in years of crop failure.

Such periods of shortage had occurred frequently in the fourteenth and fifteenth centuries and though they showed diminishing recurrence later on, they persisted nonetheless. The records of every European country abound with the comments that the crops failed this or that year and "the people of the land were wonderfullie wasted and consumed. O pitifull depopulation."

But when grain was available, the populace everywhere would have nothing but white bread. In response to this craving, bakers resorted to the adulteration of flour by adding alum. This chemical increases the size of the loaf, softens the texture of the bread and whitens it. In the course of time, some bakers were accused even of adding lime, chalk, whiting and ground bones. These rumors finally became a public scandal in 1757 when two violent tracts written by physicians appeared which brought these charges before the English public. The following year saw the publication of two replies and the contoversy assumed national significance. As usual, the reformers were too violent and too ready to press their accusations beyond the limits justified by the evidence. But the public was aroused. It seems certain today that only alum was used and that the charges of other forms of adulteration were pure inventions. Yet, the scandal led to stricter regulations of bread-making.

The accusation resented most fiercely by the bakers in those days, because it was regarded by everyone as a heinous and revolting crime, was the supposed addition of ground and powdered bones to dough. The chewing of bones is looked upon merely as bad manners nowadays, but then it was universally indulged in by the poor and well-to-do alike. Strangely enough, it was never regarded as injurious to health or obnoxious to the sense of taste. Yet the idea of eating

bread whitened by bone powder was so repulsive to most people as to arouse them to mob violence. No doubt the pamphleteers and journalists who incited people to such action were firmly convinced they were doing noble work in the cause of justice and reform. And they were. Yet history can play strange tricks in isolated instances.

Recent experiments indicate that dried bone powder is a good source of phosphorus and calcium. A bone disease akin to rickets in cattle can be prevented and cured by the addition of bonemeal to their diet. Several other cattle diseases common in South Africa have been cured by bonemeal, which is claimed also to produce at the same time an "increase of milk yield in cows, better calves at birth, more rapid growth of young stock and superior fattening of adult cattle." All this is due presumably to the phosphorus and lime contained in bone.

The nutritious elements of bonemeal are also well assimilated by the human body. It is in fact contained in some ready-made cereals and can probably be very usefully added to bread in order to increase its dietary worth.

The controversy over adulteration raged for many years with much reckless denunciation on one side and some convincing disproof of the bakers' crimes on the other. Yet, in reality the health of the people was being undermined continuously but not so much by the bakers as by the people themselves—by their desire for white bread. White wheaten flour as was pointed out is prepared free from bran and germ. Now, it so happens that the richest natural source of the important vitamin B_1 or thiamine is in the germ, lodged in the wheat berry. Bran too has considerable amounts of it. Consequently, white flour contains practically nothing of that substance so vital to health. Yet, most of humanity everywhere prefers white flour and white bread. In the Orient, too, all people crave white rice. Rice is related to wheat or rye and the process involved in getting it white is the same. The rice berry has a silver skin equivalent to bran which is removed.

There is something in the taste and appearance of white flour or white rice that seems to appeal to the human palate. But as fate

would have it, the wishes of the palate do not lead in this case to the organism's welfare but to its detriment and starvation. This is bound to be so, particularly in those lands where bread or rice are truly the respective staffs of life and where the average diet is diversified with very few other items.

In the preceding chapter we saw the consequences to health resulting from the absence of vitamin C in the diet. Equally dire and more widespread have been the consequences of thiamine deficiency which for centuries ravaged the populations of China, Japan, the Philippine Islands, Malaya and the Dutch East Indies. It was in the form of the dread disease of beriberi that it afflicted hundreds of thousands. And no wonder, since those populations practically subsisted on polished rice and consumed very little of anything else. And the disease was a real terror, with death as its frequent conclusion. Its onset is marked by loss of appetite, muscular weakness, pains and sluggishness in limbs, disturbances in intestinal functions, swellings, fall in blood pressure and low body temperature. Ultimately, degeneration of all nerves and muscles, including the heart, sets in and the patient succumbs. However, before the disease reaches its peak, administration of concentrated vitamin, or an ample consumption of food particularly rich in it, restores the patient to normal health as magically as orange juice eradicates scurvy.

For centuries, man groped in quest of a cure for this tormenting disease. He groped in the same blind and pathetic manner as he did for the cure of scurvy. In his misery he put his faith in one medicine-man's brew or another but many dead were buried in the interim with much pain and tears.

It was not until 1884 that the first genuine victory was won over the treacherous "scourge of the Orient." For years the growing Japanese navy watched as many as forty percent of its numbers invalided by beriberi. In that year Baron Takaki, a Japanese naval officer, succeeded in eradicating the disease from the Mikado's ships by cutting down on the rice portion of the sailors and supplementing their rations with a variety of other foodstuffs. He incorrectly believed that both the cure and the prevention were due to his having enriched

the diet with proteins but he did establish the dietary origin of the disease. His successors accomplished the rest.

Thirteen years later the Dutch physician, Eijkman of Java, succeeded in inducing beriberi in chickens after maintaining them exclusively on a diet of polished rice. Strangely enough, this discovery was made while he set out to prove the infectious nature of the disease. Eijkman quickly followed this fortunate lead and proved conclusively that a diet of unpolished rice failed to produce the scourge and that rice polishings cured it. It was his discovery of a good experimental animal subject to the disease which made all of these studies possible. Though Eijkman still clung to the belief that the disease was due to the presence of a poisonous substance, his successor realized that it was the absence of something in the diet that caused it. This was a new concept and most medical men of the time imbued with the folklore of poisons and humors were slow in accepting it.

But the study of the chemical components of rice polishings went on apace and the search for that mystifying substance which could so magically wipe out the disease spread to many laboratories. It was while working with a crude but crystalline preparation of this substance, later christened thiamine, that Funk had the brilliant intuition to classify all substances whose absence in the diet caused deficiency diseases as vitamines, a term still in use though changed to vitamins.

At about the same time, Vedder and Williams studied the problem in the Philippines, curing thousands of human victims of beriberi with potent extracts of rice polishings. Continuing these studies for many years, Williams finally succeeded in preparing this vitamin thiamine in pure form and in determining its true chemical nature. It is now being produced synthetically and economically on a large scale and, needless to say, beriberi has virtually disappeared wherever science can penetrate.

It is strange that man should be so poorly provided with an instinctive sense of self-preservation as to permit beriberi to rack his body. The preventive vitamin is present in a vast variety of foods

and only the most limited taste or habits can keep it out. Its omission could readily occur in the Orient because there only the very rich could afford additional foodstuffs besides the polished rice so cherished by all. Excellent sources of thiamine are all seeds and nuts such as beans, peas, raw peanuts, oats, whole wheat, rye, as well as lean meat, especially pork, egg yolk and milk powder. It is also present in significant amounts in asparagus and broccoli, in corn, roasted peanuts and potatoes, in prunes, turnip greens and pineapple. This vitamin too, like vitamin C, is partly destroyed by cooking and is dissolved out by water. Boiling peeled potatoes in much water and pouring it away robs the potatoes of whatever thiamine they had. They should preferably be cooked in their skins and with extremely little water. When peeled, the amount of water added should be just enough to supply steam.

It can readily be seen that with our dietary habits and tastes, which also dictate the amount we usually consume, our most reliable supplies of thiamine are the whole grains or their flour, pork and other lean meats, dried peas, beans, sweet corn and potatoes. The other items listed we do not as a rule consume with comparable regularity or in large enough quantities, but rather as supplementary sources.

Now at first glance one might think that there is no danger of shortage of thiamine in our diet since the above foodstuffs are usually eaten pretty often and in satisfactory amounts by almost anyone. But nature apparently saw to it not to make life too easy for us so as to oblige us to keep our wits about us and be on the alert. To begin with, the amount of thiamine needed depends on what the other items of our diet are. Also, the higher the energy expenditure of the body, the more thiamine is required. The more sugar we consume or the more starch, the more of that vitamin is needed. Should we feed largely on protein or fat, for example, we would need less thiamine to maintain our system in good shape. Thus, eating polished rice or white, unenriched bread or potatoes cooked in much water which, in addition, is discarded makes for quite a vicious circle. Not only is the thiamine thrown out or destroyed in the preparation but

because these foods are all starches, the body requires more thiamine than normally.

We should point out here that starch such as is found in flour, potatoes or corn is the name given that chemical substance which is composed of carbon atoms attached to each other like beads on a string with atoms of hydrogen and oxygen linked to each bead. The starch molecules are very large and complex in structure. It is essentially an energy-yielding substance, forming the fuel of our bodily engines and maintaining our capacity for work. We are all familiar with the digestive juices of the stomach that break up our food and convert it into smaller molecular particles which the body can readily assimilate. There are many kinds of these digestive substances so as to enable us to break down all the various types of foods we consume. We also possess many types of starch-splitting enzymes, as these digestive substances are called, which break up the complex starch molecule and convert it ultimately into sugar.

The sugar molecules are then absorbed by the walls of the intestines and sent into the blood stream, which takes them to every cell of the body. In these cells sugar is used as fuel to keep the tissues functioning. What is not used up as energy is deposited by the blood in the liver and muscles as stored food. Some of it goes into fat. Hence, an excess of starchy food is not desirable but a certain amount is essential for protection and energy. Besides, bread and cereals also have some protein necessary for the maintenance and repair of our tissues and organs. Starches never really occur free in nature. They are always mixed with proteins, vitamins and minerals. Our main task today is to leave our natural sources of starch so mixed and check our craze for "purification."

The second point of importance with regard to thiamine is that the human body is not very good at storing it, so that for normal health a constant daily supply is needed. Hence, not only is it necessary to be on guard for the proper thiamine-rich foods but it is essential to take special precautions not to lose or destroy this vitamin. We know that it is lost in the making of white flour and bread and that it is destroyed through careless boiling and wasted in reck-

less and sloppy cooking. How can these menaces to health be stopped?

It has not been found very profitable to insist that people eat brown or whole wheat bread. The public does not seem to want it and white bread still retains its appeal for about 95 percent of our population. Many campaigns have clearly shown that the effort to change the popular taste seems useless.

Advertising, which many people think is a magic power that will do almost anything, has been relatively impotent in this country as well as elsewhere. Some baking establishments recently spent several millions of dollars in radio and newspaper advertising during one year and freely gave away samples in order to endear whole wheat bread to the public. It proved of little value and led to bankruptcy or dissolution of the firm.

A happy solution then suggested itself which solved the entire problem pleasantly and effectively. Since this vitamin can now be prepared commercially at a modest price, why not add it to the white flour and bread? The craze for white bread will be satisfied and simultaneously our health will be saved.

It is thus that enriched flour and bread came into being as a happy and painless compromise. The expense of adding thiamine is so small that there is no extra charge on bread and only a few cents extra are asked for fifty pounds of flour. Moreover, it is not thiamine alone that is added to white flour to make it enriched. Scientists and health administrators have suggested from the start that niacin, the pellagra-preventing vitamin, and the mineral iron which prevents pernicious anemia be also added because they too, like thiamine, are lost in the process of milling.

The term pellagra comes from the Italian "pelle agro" meaning rough skin. The disease first appeared in Europe, particularly in Spain and Italy a little before the time of the American Revolution, and about one hundred years later in the United States. It still occurs to some extent in our South. Its numerous symptoms start with skin rashes, but the disease also afflicts the tongue with swellings and attacks the stomach, the nervous system and the muscles, causing

dizziness and numbness, and often insanity and death. It is a terrible and dreaded disease that had baffled the cleverest of physicians until Dr. Goldberger and his assistants of the U. S. Public Health Service proved it was produced and maintained by a faulty diet. This they found after years of work with the suffering and dying in the hospital and with properly devised experiments in the laboratory. Only recently it was proved that pellagra is caused by the absence of a substance known as niacin, a member of the vitamin B group, present in abundance in the wheat kernel but lost in milling.

The addition of iron in the making of enriched bread supplies our bodies with this most urgently needed mineral also lost in the process of milling. Its absence leads to anemia which impoverishes our blood by depriving it of the substance which gives it its red color and which is found in the blood cells. This substance carries the oxygen we take into our lungs to every cell of the body. Without iron this substance cannot function, and its absence leads to anemia or blood shortage as well as to pernicious anemia where the red blood cells do not function properly.

Enriched bread then contains these three added substances. When the proposal for the enrichment of bread was made by the scientific authorities it was realized from the start that industry would not accept this innovation all at once. It was not only the extra expenditure which prompted this unwillingness but the usual reluctance to try new practices. The argument was given by many bread manufacturers that the public disliked the term enrichment because they believed it would lead to fattening or because all additions were suspect. Experience proved these forebodings to have been largely incorrect.

Many bread manufacturers would not enrich their bread and gave other excuses besides those cited. It was equally obvious that Federal legislation to make enrichment obligatory would have been very difficult to obtain. As a result some States passed their own laws to that effect. The exigencies of the war, however, did the cause of nutrition a good turn, and early in 1943 by presidential decree all enrichment was made compulsory for the entire country.

The importance of the nutrient values of enriched bread need not, however, stop here. Recent experiments have shown that the enrichment of bread with powdered, dried or skim milk makes it a far superior nutrient product than either whole wheat bread or white bread enriched with thiamine, niacin and iron. Its more nutrient qualities are proved by the fact that experimental animals raised on bread enriched with milk solids, in addition to thiamine, niacin and iron, grow more rapidly, are bigger, healthier, and live longer than animals fed on any other bread.

It might not be out of order to mention the fact that since bread is eaten by everybody, it constitutes an excellent medium for correction of many dietary evils. In England, for example, calcium is added to bread, since this mineral tends to be consumed in deficient quantities by the average run of the population, and only people who drink enough milk and eat enough milk products seem to get a sufficient quantity of it. In emergencies and in cases of unremediable shortages the full enrichment of bread may be the answer to the numerous speculations about a pill that has all the dietary requirements. It has the advantages of not being a pill, of being a food to which we are accustomed, and of filling the stomach as well.

It is difficult to see, however, why this possibility need be considered seriously when many other foods are available and when a modicum of information about nutrition could easily solve most nutritional problems. It goes without saying that a certain section of the population, however small, whose income is below that which can buy an adequate diet can hardly be benefited by nutrition education. When that factor operates we simply have an infected area on the body politic and a social misfortune demanding a prompt cure.

Under all circumstances, the nutritionally complete bread is hardly an urgent matter at the present, since the scheme is speculative, uncertain, untested, and difficult to achieve under our economic system with its accompanying psychological adjustments. At best it can only be a partial solution to dietary improvement. The question has here been raised purely in a speculative way and should be regarded in that light.

The evil effects of a thiamine-deficient diet are numerous and far-reaching. We have already mentioned the kind of over-all damage the deficiency achieves when given full sway. But this of all vitamins is the most elusive. Not only can it be destroyed by heat and lost in the water through ruinous cooking, but it fails to be stored to any considerable extent in the body and is required in greater amounts during active growth such as in childhood, during periods of fever, pregnancy, and nursing. Many diseases increase the body's normal requirement of thiamine. Such diseases are tuberculosis, chronic intestinal disorders, immoderate alcohol consumption and malaria. Hence, we must either take this vitamin in excess or make constant adjustments to whatever our physical conditions require at the moment.

In addition, the invisible subclinical damage wrought by slight shortages in this vitamin are quite dangerous. The heart and blood pressure develop weaknesses, loss of appetite sets in as well as intestinal difficulties such as constipation. Nervousness and fatigue result as well, though not in sharp enough form to pin the suspicion on a deficiency. And the longer these mild symptoms persist the more dangerous their sapping of health.

It is of interest that thiamine has been found to be part of an enzyme involved in breaking down carbohydrates, as the starches, sugars and their derivative products are called. Shortage of thiamine means shortage of enzyme and shortage of enzyme spells poor utilization of starch and sugar. Such utilization happens to be the most basic energy- and health-yielding reaction in the body. The vitamin is thus a precious ingredient of an enzyme usually present in small concentrations in the body but instrumental in key reactions which are essential to proper functioning of tissues and organs. Those who use all available knowledge and will power to be on guard against its faulty supply in the diet, strengthen their health and lengthen their years.

Chapter VII

Milk and Milk Products

Milk and its products occupy a vital place in the diet of humanity. Unlike the grains and their flour, which date back more than twenty thousand years, milk is a fairly recent food, hardly more than five or six thousand years old.

Ask people why man domesticated the cow and they will invariably answer in terms of our present exploitation of this most important servant to man. For the use of her meat, they will say, for her milk, for leather or perhaps for her value as a draft animal in ploughing. The truth seems to lie far from any of these answers. The cow was domesticated in Egypt, where from the start the animal was considered holy, even as it still is today in India and elsewhere. This meant that the meat of the cow or bull could not be eaten, though the flesh of oxen was, and surely it was not the ox that was domesticated first. Nor was the skin made use of, though Egyptian records indicate that the dead were often wrapped in the skin of cattle. It is known besides that the plough was invented and the ox harnessed to it much after domestication had been accomplished. That the desire for milk could possibly be a motive for domestication is highly questionable. No animal in nature has enough milk to give away. Similarly, the ancestors of our modern sheep had no wool to speak of. Good quality or good yields of either milk or wool are the results of thousands of years of selective breeding.

Besides, the very concept of even tasting some animal's milk requires great courage and ingenuity on man's part. Even with our practice of using some animal's milk, any one of us will hesitate before tasting the milk of a mare, camel, donkey, or any other mammal whose milk is drunk by millions of human beings elsewhere on the globe. How much courage and cleverness ancient man

required to think of the idea of drinking milk or even of merely tasting it!

In reality the cow was domesticated for the same reason that any other animal was, namely, because man liked animals and the companionship they gave him. There is nothing strange in that since it is for the same reason that millions of people keep dogs, cats, turtles, birds or any other pets today. Incidentally, the dog was eaten by many millions of human beings in numerous tribes on most continents and was raised by them primarily for food. Now, imagine asking any of those people why the dog had ever been domesticated. Their answer will be just as prompt and certain as is ours with regard to the cow. They will find it hard to understand why anyone should keep dogs for any other purpose than food.

Even the very act of domesticating the dog tells us a great deal about man and his relation to nature. The dog was man's first domesticated friend. Early excavations of human campfire sites, going as far back as forty thousand years, show the bones of dogs some distance from the human remains. Excavations of a few thousand years later consistently show the canine bones together with the human. This is taken to mean that at first the dog lived as a scavenger near human dwelling places, feeding off his refuse. In the course of time his proximity, harmlessness and sociability suggested to man the idea of domestication, which in a way grew upon man rather than evolved as his own brainchild.

Historical evidence also indicates that once man became aware of the notion of domestication, of the companionship and pleasure it offered, he applied it liberally to all animals. However, not all animals proved to be good domesticable material. Man was thus obliged to use his judgment, discard those which he could not tame into enjoyable conduct and retain those that showed promise. These were persistently subjected to selective breeding, a process which is still being diligently pursued with never-failing results. The desirable individuals of each generation are selected for breeding and in the course of time a better race is obtained.

To return now to the subject of milk. All evidence indicates that

man had to be taught, so to speak, by circumstances to start along the path of domestication. Similarly, the utilization of milk as food came as the result of a combination of advantageous conditions. Egyptian records speak of milk as used for sacrificial purposes and also as possessing great medicinal value. Thus, the Greek writer Diodorus relates that on a holy island of the Nile dedicated to the God Osiris, who was presumably buried there, there was a flock of holy cows and 360 pitchers full of milk were daily sacrificed. This refers, of course, to Roman times, hence is of relatively recent date. By that time selection had already produced good milch cows. Inscriptions tell us also that besides sacrificing milk to the gods, priests and medicine-men gave it to the people "to restore their bodies to health." The Jewish historian, Josephus, writing during the lifetime of Christ, says the following about the Biblical story of Cain and Abel: "Abel brought milk and the first fruits of his flocks as offerings to the Creator, who was more delighted and more honored with oblations which grew naturally of their own accord, than with the inventions of a covetous man whose offerings were got by forcing the ground." The contempt for agriculture here expressed is typical of herders and cattle breeders.

Early Egyptian records indicate that milking was no easy matter then. Many wall paintings show one man holding on to a foreleg of the cow whose hind legs were tied, while another is milking her in a bent-over position. Some paintings show the forelegs tied to each other as well as the hind legs. Such laborious milking does not bespeak the widespread use of milk as food. In all likelihood, it was used first for sacrifice and medicine and developed later as a food.

Not only was the milk of cows used as food in Egypt but the milk of goats as well. The milk of the mare, camel, or donkey was not exploited though these animals were domesticated. Their milk has, however, been used by other human groups so that Egyptians, like all other people, showed ingenuity and courage in exploiting some aspects of nature but knowingly neglected or failed to explore other possibilities. With other groups the same rule holds true but in reference to different things. Often excellent possibilities are not merely

neglected but are, as if maliciously, buried in an ocean of unverified, harmful and fantastic prejudices.

The mere discovery of milk as food does not imply that man was aware of the fact that he had gained mastery over a natural product and was going to make the most of it. Far from it. It is still true today that in most countries of the world milk is used for very young infants and for the sick and convalescent exclusively. Adults do not seem to consider it a worthy food, and that is not due to ignorance or its high cost. In addition, particular foods rise and decline in popularity with time. For example, in England milk and cheese were used extensively as food by the poorer classes in the fourteenth and fifteenth centuries. They were referred to as white meat, and their prices were very low. With the coming of commercial and industrial expansion and the resulting prosperity, less milk was consumed, though cheese and butter were on the increase. Fashion decreed that milk, like vegetables, was food of poverty for the peasantry, and meats and alcoholic drinks became the craze even among the laboring classes.

The vast diversity of nutritional practices in human groups affords us many ready-made experiments in nutrition. Human diets are as varied as are languages, beliefs, and traditions of tribes and nations. Much is left to chance in the process of social development. The mechanics of this process are as yet very little understood, but we know that it permits one group to evolve one set of customs and beliefs and another, even a closely neighboring one, an entirely different set. This force for the creation of diversity operates just as strongly in the field of values, such as religion and belief, as in the field of social institutions, such as social structure or form of government. It operates as well in the sphere of food, in methods of preparing it or in table manners. To say that the environment or climate determines these customs is to state a palpable falsehood. To say that these practices are influenced by the environment is to state a platitude.

There have evolved three totally separate and different human culture areas where the people live almost exclusively on milk—the

Kazak Kirghiz of Central Asia, the Bedouins of Arabia and many Bantu tribes of Africa. Racially, these groups are mixed Mongolian, white and Negro.

The nomads of Central Asia subsist almost entirely on milk products. They are a sturdy and robust stock, though of moderately short stature. Their most prized animal is the horse and their staple is mare's milk. Men and women are excellent riders and use only geldings for that purpose, never the mare. Most of the mare's milk is consumed in the form of kumiss, which is fermented and is equivalent to milk wine. The famous traveler Marco Polo was much impressed by it. Horseflesh is considered a great delicacy but is eaten only on rare occasions.

Sheep, cows, and goats are also kept in large numbers but little of their meat is consumed. Beef is practically never eaten, mutton very rarely and goat meat not at all by most tribes, though a few prize it highly. While mare's milk is the main food at each meal, especially the intoxicating kumiss, the milk of cows, goats and sheep, never yielded in great abundance, is rapidly soured and converted into a curd or cheese. Butter, too, is made and so is "airan," the name given the curded milk. All milking is done by women. The prestige or status of an individual is measured by the number of animals he owns. On the other hand, hunting is a very popular and enjoyable sport and the meat of captured animals is sometimes eaten. Some agriculture is practiced although as is usual among nomads and herders, it is looked down upon. But in general, "vegetables, fruits, cereals, game and fish supply a very small part of their diet. Bread is seldom used, but unleavened bread, fried in muttonfat, is partaken of, when obtainable. Little meat is consumed for they like to keep their animals, which constitute their wealth. The rich never touch beef and others only rarely; camel's flesh which is always tough, is only eaten when nothing else is available; while horseflesh which is much prized, especially that of young fat mares, is rarely consumed. When it is necessary to kill a large number of animals on account of the severity of the winter, the herders gorge on meat. . . . Their diet is comprised mainly of milk and its products: butter,

cheese, airan and kumiss. In the summer months the rich subsist almost entirely on kumiss, of which they drink enormous quantities."

They have no notion of money. What money means to us, herds are to them. Whatever coins they obtain they melt into jewelry for their women who like to cover themselves with metallic ornaments.

Exactly seven hundred years ago Europe was ravaged by the Tartar hordes. "From the scourge of the Tartars God deliver us," was a daily prayer in Russia and Poland. These nomads devastated even much of Germany and Austria and would have advanced on Paris and Rome had not their generals been recalled because of their emperor's death in Asia. Their main food was mare's milk which they drank in large quantities, both fresh and fermented. They were skilled riders and being mounted on mares, their food supply was always with them in the form of mare's milk and horsemeat. Captured cattle added only a slight diversion to their diet.

The herders of Arabia also live on milk but not that of horses. These are highly prized for riding, raiding and races. Unless one owns a horse, one is not a respected member of the community, and social status is judged by the number of horses owned. Their milk and flesh are never used.

The most useful animal is the camel. It supplies milk and meat, wool and hides, and its dried dung is employed as fuel. Yet any Bedouin would rather part with his camel than with his horse.

Besides the milk of camels, nomadic Arabs also eat seeds, such as the tiny red seeds of *samh* often called wild bread, locusts, consumed boiled or roasted, and occasionally game. But their main food is milk and cheese.

There are tribes that raise no camels but breed asses. Though these people are looked down upon by the camel herders, they make the same use of the donkey as the others do of the camel. They also live mainly on milk and cheese and supplement their diet occasionally with seeds, fruits, especially dates, cereals and game.

Something has already been said about the milk-drinking Bantus of Africa. They, too, eat vegetables and meat, but only on rare occa-

sions, and subsist almost entirely on cow's milk, curd and cheese. Meat is rarely eaten because cattle is wealth not to be destroyed for food. Milking and herding are done by men only and women may not even touch the kraal or the men about to milk or attend the cows. The adoration of cattle, the role of the cow in the religion and life of the people is something difficult for us to understand. Suffice it to say that it is the very central theme of the people's life and faith. The Kaffirs of South Africa also live almost exclusively on cow's milk in the curdled form, which like the Arabs they mix with some cereal such as millet and consume in the evening. This is their single meal for the day. They, too, are fairly strong and robust. The Lapps of northern Europe live on reindeer milk. In addition, we should bear in mind the fables of old in which heroes, abandoned in childhood, are nurtured by some animal's milk. People had apparently known that youngsters like infants can subsist and prosper on milk.

Already in Biblical times, milk, butter and cheese occupied a respectable position in the diet of the people. Abraham offered butter and cheese to the strange visitors whom he construed to be divine messengers, and David carried ten cheeses to a captain of thousands among whom his brothers were, cheese being an army ration with the Jews as with the Romans. It was in the execution of that mission that he met and slew Goliath. Yet, in our civilization milk and its products never reached the status of a staple as it did in the cultures mentioned. But, as a major food, it certainly is on the upswing in this country. Only one hundred years ago it was considered a convalescent's drink in many of our cities even as it is in most of Europe today. But of late, the picture has changed considerably. Milk is becoming more and more established as a drink to appear at any meal on every table of families that can afford it, even as is water. It has already become a national tradition for our children and youths to consider it as essential as bread. If anything, it is a stronger and more persistent habit than bread in many children. But what is really significant is that our adult population is ceasing to regard it as juvenile fare and the trend of the times points to its becoming a regular item of everybody's daily diet.

The value of this significant nutritional development can only be properly understood if we examine the virtues of milk as food. It has been with man for thousands of years. He obtained it in different localities from different animals. It reached varied positions of importance in different cultures or even at different periods in the same culture. In most advanced countries, it is definitely increasing in importance, thanks particularly to the findings of science which has recently declared it an almost perfect and complete food.

Milk is a suspension of nutrient materials in water. The water constitutes about 86 percent of its total weight. The 14 percent of nutrient solids are divided between milk sugar, 5 percent, fat in the form of cream about 4 percent, protein just a fraction less than that, and finally minerals and vitamins. The latter, although extremely important in their physiological roles in the body, are present in minute amounts. But then these elements of the diet, the vitamins and the minerals, owe their entire significance to this peculiarity. It is precisely because they are effective in small amounts that we may slip up in their delivery to the body, miss their physiological function and suffer severe consquences.

Even before we consider the values of fat, protein, and sugar in our diet, it can readily be seen that milk is a kind of natural combination containing all the organism's requirements for growth and health. Little wonder then that it is the nourishment with which mammals carry their helpless young through the critical stages following their birth until they can manage by themselves.

Something has already been said about starches and carbohydrates. These are chemicals which serve to supply our blood stream with sugar destined to reach the cells where it is used for the production of energy. A little more will be said about this process when we discuss the problem of sugar.

More will also be said about proteins when we come to discuss meats and similar foods, though we have already encountered them as gluten in bread. We shall also discuss fats subsequently in some detail. We need not, therefore, dwell on these subjects here. Suffice it to say that milk has them all—proteins, sugar and fats. What is

unique about milk besides its variety of contents is its richness in minerals and vitamins. And for this reason, it is labeled a protective food. The fat, sugar and protein can come from any other sources, but the vitamin A and the minerals of milk cannot be easily substituted elsewhere. It is also rich in the vitamin B group so urgently needed for health.

Calcium and phosphorus are the two minerals contained in milk that are of primary importance to us, not only because they are essential to the growth and maintenance of our bodies, but because it is very easy for the American diet to miss them, especially calcium. Fundamentally, the human body is composed of chemical minerals or elements, as is all matter, living or non-living. For example, our bodies are composed of 65 percent oxygen, 18 percent carbon, 10 percent hydrogen, 3 percent nitrogen, 1.5 percent calcium, 1 percent phosphorus with the remaining 1.5 percent consisting of potassium, sulphur, sodium, chlorine, magnesium, iron, iodine, and traces of many more elements. As we have already seen, carbohydrates supply plenty of carbon, oxygen and hydrogen and so does the bulk of fats and proteins. This latter group also supplies nitrogen, sulphur, and sometimes phosphorus. The other minerals must come from other sources, such as milk. Fruits, vegetables and whole grain cereals also have many of them and are superior to milk as sources of iron, as are also eggs and lean meat. But milk is by far the best source of calcium and phosphorus.

These minerals are essential for bone growth and maintenance. The very process whereby bones are formed by specialized cells which can secrete calcium or lime materials and fashion the bone structure and shape to every minutest detail is, of course, a most wonderful physiological phenomenon. Though these processes are not yet fully understood, we do know that the proper formation of bones requires besides calcium, some phosphorus, and also vitamin D or the sunshine vitamin so abundant in fish livers or in the oils extracted from them. All of these three elements are essential to normal bone and teeth development. All three are essential to the growing infant or youth, to the expectant mother whose nourishment

or tissues must provide for the developing embryo and to the adult whose tissues must be continuously replenished.

Not only is milk rich in bone-forming calcium and phosphorus but, what is equally important, it carries them in readily usable form. The same minerals are also found in vegetables such as carrots, but experiments prove that they are much more readily assimilated from milk. This means that our body finds it easy to remove these minerals from the milk, incorporate them into its own tissues and deposit them easily and rapidly where needed.

Special note should be taken of the fact that when we say that calcium, phosphorus and vitamin D are required for bone formation, we also mean teeth. Because a few decades ago it was brought to light how important hygiene is, there was a tendency to overlook the role of nutrition in the development and maintenance of good teeth. No toothbrush can undo the havoc wrought by an unbalanced diet. It is essential that expectant and nursing mothers see to it that their diets are safe on that score and that the growing embryo or child has an abundance of teeth-building minerals.

Yet, it is fortunate for us that we do not have to subsist on milk alone. Milk does not supply the body with enough iron so urgently needed to prevent anemia. To prevent shortage the new-born infant has enough iron stored in it for the requirements of the first few months or even a year of its life. Milk also lacks vitamin D, although sunshine easily compensates for that shortage. Under our conditions of preparing it, milk also lacks vitamin C with which we are already familiar as the anti-scurvy vitamin of many fruits and vegetables.

Milk as produced and collected in the udder has considerable amounts of this vitamin. Much of it is lost, however, in the process of pasteurization which involves heating the milk to a temperature of 145 degrees Fahrenheit for thirty minutes and then cooling it rapidly to around 45 or 50 degrees at which temperature it is poured into sterile bottles. This treatment destroys all harmful bacteria in milk and renders it fully safe. The taste of the milk and its nutritive or protective values are in no way affected, and it is made even more digestible than before. There is, however, some loss of vitamin C,

appreciable because milk does not contain too much of it to begin with. But pasteurization is more than worth the loss incurred.

It so happens that milk, though intrinsically an excellent, mixed food, can also be a dangerous carrier of infectious diseases, often causing the spread of serious epidemics. Two factors contribute to this danger. One is the contamination of milk by human carriers of germs, as when a stricken individual works at a dairy, and the other is the diseased cow herself, suffering as cows do chiefly from cattle tuberculosis or infectious abortion. Thus, as late as 1927, Montreal was the victim of a typhoid fever epidemic due to the pollution of milk by a human carrier of the disease. It involved 5,002 cases and brought 533 deaths. In 1928, the town of Lee, Massachusetts, was the victim of a septic sore throat epidemic involving 1,000 cases and 45 deaths. Diphtheria, scarlet fever, and diarrhea may also be spread in this manner, and cause great mortality in bottle-fed infants.

These dangers of human contamination are obviated by pasteurization and bottling under most sterile and sanitary conditions. As soon as pasteurization of milk was introduced, milk-borne diseases vanished. In addition, herd infection has diminished of late due to intensive care and inspection of cattle. In general milch cows are now guarded medically with greater care and efficiency than most people lavish upon themselves.

The feeding of cattle has also been improved in recent years to a degree not reached yet by the level of our own nutrition. At first, ignorance, narrowmindedness and greed led people to keep cows which supplied milk for city markets in dark, filthy pens without air, exercise or green vegetables. These pens were usually situated near distilleries and the cows were fed the distillery slop, or the refuse of the fermented grain used to produce alcohol. The milk was watery and poor and the situation was not relieved until some investigators and reformers called public attention to it.

The beneficial components of milk have been prepared by human inventiveness in the form of a variety of milk products. These are quite numerous and diverse in taste so that people who lose the battle of regaining the taste for milk may not be cheated of some of

its benefits. Practically all of these products are as ancient as milk. Cream, butter, cheese, buttermilk, the fermented milks not much favored by us, are all ancient inventions, readily hit upon by man wherever milk is produced. Ice cream alone is of recent origin.

Cream consists largely of the fat of milk. Fat, as is well known, floats on water so that the fat globules present in milk accumulate on standing as they rise to the surface. Now, it happens that vitamin A, the one which prevents night-blindness and the lack of which causes eye deformation, stunted growth and other disturbances, is soluble in fat only, though its precursor or mother substance is soluble in water and is found in abundance in carrots and other yellow vegetables. Cream will, therefore, contain the bulk of that vitamin. So will butter, which is consolidated milk fat obtained by churning the cream or whole milk. The residue constitutes buttermilk, a slightly acid, nutritious and easily digestible liquid possessing the added advantage of being rich in beneficial acidophilus bacteria so helpful to the proper functioning of the digestive tract and in preventing constipation. The residue also contains most of the milk minerals and proteins. Nutritionally, it is equivalent to skimmed milk plus digestion-aiding bacteria. Like skimmed milk, all it lacks is the fat and the vitamin A which the fat dissolves. This shortage is readily made up in the customary consumption of butter and yellow vegetables.

While cream and butter contain the fat of the milk, cheese constitutes its congealed protein plus, of course, some fat, its vitamin A and some minerals. The main protein substance of milk is casein. No wonder the ancient Hebrews and later the Romans used cheese as an army ration. It is a rich, pleasing and digestible food. In fresh milk or even in boiled, it is suspended in the form of fine particles. Under the influence of action by enzymes present in the juices of the stomach, it curdles just as fresh white of egg hardens on heating. It is this curd which constitutes cheese, although there are more than four hundred different varieties of it. Like the different wines, cheeses are named after their place of manufacture.

After the milk casein has coagulated into a curd, it is heated

slowly and worked to separate it from the liquid, called whey. This contains the water of milk, its sugar and some of the salts. The curd contains the fat and protein and some of the minerals. To convert it into cheese, it is salted and left to ripen under the influence of beneficial bacteria. These help break down the original protein into a more palatable and still more digestible form. The taste as well as the character of cheeses depends in great measure on their place of origin. Not all cheeses derive from cow's milk. Some, like the French Roquefort or the Italian Gorgonzola, are made from sheep's milk. Some are made from whole milk and others from skimmed.

Among milk products we must not fail to mention two, both of which have large and devoted publics. One is ice cream, so popular in our own country, and the other is the class of fermented or alcoholic milks which are great favorites with other and less sophisticated peoples. Ice cream is a frozen mixture of cream, milk or its products, sugar and flavoring such as eggs, fruit or nuts, and had its origin in eighteenth-century Italy or France. The fermented milks are numerous in southern Europe, in Asia, the near and middle East and elsewhere. Most famous of these are the kefir of the Cossacks, the kumiss of the Kazak Kirghiz and Mongols, the yoghurt of Bulgaria and Turkey, the matzoon of Armenia, the leban of Egypt, the dadhi of India, and the taetle of Scandinavia. Kefir and kumiss are alcoholic and intoxicating, the others are like yoghurt, simply soured by bacteria and containing very little alcohol.

We also have, of course, the concentrated forms of milk, such as evaporated, condensed, and powdered. These are whole milk equivalents minus some or all of the water. They are obtained by a process of drying or removing the water by a variety of means.

It is easy to see, then, that any milk product whatsoever has nutritional value, though the maximum is obtained from whole milk, either in the fresh or some concentrated form. Next to whole milk come the cheeses, especially those prepared from unskimmed milk. Skimmed milk, in spite of its past connotation as an impoverished, worthless by-product, is an excellent food as far as it goes, either in liquid form or as the dried powder. It is particularly good food for

people who do not wish to gain weight. By eating some butter or, better still, some vegetables like carrots or broccoli, they can easily obtain the desired vitamin A. Skim milk still has the protein, some fat, all the sugar and the minerals of whole milk. Even whey, although less valuable than skim milk, has much nutritional merit. In this country both these products are used mainly for cattle; they thrive and prosper on it. It is, however, reasonable to demand that people should come first, especially since millions stand in dire need of it, particularly in the South where milk is expensive and the poor are very poor.

Dried skim milk is a very nutritious product, although it happens that it is still regarded by many as adulterated and of low quality and prestige. Because of the poor reputation it enjoys many who need its nutritional blessings stubbornly refrain from using it. To overcome its popular disrepute permission was asked of the government by dairy owners to have its name changed from dried skim milk to dry milk solids, thus removing the stigma attaching to the name. Some ardent consumer representatives objected at congressional hearings with the argument which has invariably constituted the bulwark of conservative opposition to change and progress, namely, "if this change is permitted, all our institutions will crumble, grass will grow in the streets, etc." Specifically it was argued that such a step would break grade labelling. Besides, it was also claimed that the truth must be told on the label regardless of consequences.

To the nutritionist concerned with improving the food supply and eating habits of those who stand most in need of it this is harmful reasoning on the part of consumer representatives. Grade labelling is in no way menaced by such a step. The product is good and can augment health and happiness. If a snobbish prejudice such as the past contempt for skim milk stands in the way, why not circumvent it by changing the name? To uproot the prejudice would require decades of effort. But such is human reasoning that a great physician and scientist who made this plea before Congress for the change in name was immediately accused of being a hired agent of the dairy interests on the evidence that he had worked and taught at a great

clinic in Minnesota which is near Wisconsin, a state famous for its dairy industry. Such are the pitfalls of human prejudices. Surely when it comes to inventing motives, the sky is the limit and freedom of speculation knows no bounds. Yet many world-famous economic faiths and psychological theories are built upon no other foundation than the imputing of motives spun out of the fertile imagination of man.

The exceptional merit of milk lies not merely in its diversity of contents, such as energy-yielding sugar and fat or body-building protein, but in its combining these with the minerals, calcium and phosphorus and also with vitamin A and the vitamin B group. These alone make it the foremost protective food and, as such, it should be on the number one list of our diet. The nutrients in it should be regarded as a valuable bonus from nature. Skim milk has all these virtues, and many are the people in this country who need the dietary help it offers, especially at the low price it commands.

We must not leave the subject of milk without giving a brief account of man's notions about the milk of nursing mothers and the feeding of infants. For some reason the belief prevailed in antiquity that colostrum, or the milk produced during the first few days after delivery, was indigestible and harmful to the child. As usual the physicians and scientists of the time had a name for the harmful quality. They called it "caseous," which contemptuous designation completely disqualified such milk. No mother could nurse her child for days or weeks after confinement unless she wanted to make it ill.

The main problem which concerned the physicians of the period was how long did the harmful quality reside within the new milk? Some claimed that no mother must nurse her child the first ten days; others agreed with the great Roman physician, Soranus, that she must not feed the baby until after three weeks. As usual, there were a few dissidents who advised breast feeding immediately after birth.

For this and other reasons wet nursing became an established institution. To prevent loss of milk by the mother, the first milk was drawn off mechanically. Often older children were made to suckle in order to bring relief to the mother, since it was believed that they

would not be harmed. When no wet nurse was available and the baby had to be fed, its mouth was smeared with rose honey, which was supposed to counteract the indigestibility of colostrum.

It was not until the eighteenth century that a different view began to gain ground. Several outstanding physicians of that period claimed that the first milk was not harmful but, on the contrary, was eminently suited to the delicate condition of the child. Moreover, the subsequent changes in the milk corresponded with the needs of the changing constitution of the growing infant.

While wet nursing was seldom practiced in primitive society it became quite common in antiquity with the development of prosperity, conquest and social strata. Physicians shared the common views of the period that it was proper for the well-to-do to have wet nurses and that only poor and uncultured women nursed their own offspring. As we shall see similarly in a later chapter in the case of spices, it was the ethical and moral leaders who opposed the undesirable institution of wet nurses on the basis of what might be considered unscientific grounds, while the scientists of the time defended the evil habit on false grounds. Apparently history is about as full of paradoxes as is the conduct of human beings.

The moralists claimed that nature had intended the mother to feed her offspring and that wet nurses were an unnatural luxury and therefore unsalubrious to mother, to child and to society. Thus Caesar praised the women of Gaul for suckling their own children and Tacitus lauded the barbarian Germanic women on the same grounds.

After the fall of Rome and during the so-called dark ages, the old Roman practice of wet nurses vanished and all mothers nursed their young. We read of a queen during the thirteenth century who made her child vomit up the milk obtained from a noblewoman of the court who had kindly suckled the infant during the mother's absence. But in the fifteenth century we find the custom of wet nursing again restored among the nobility and their satellites to the glory and prestige it had enjoyed in Rome twelve centuries before.

On the other hand during the sixteenth century many cultural

leaders of the time, such as Erasmus of Rotterdam and others, urged a return to a natural mother-child relationship. We also find a physician here and there advancing the same views. They claimed that nursing was best for the mother, who was threatened by the unused milk with "inflammations, tumours and even cancer of the breast," as well as for the child. The famous French physician, Desessartz, even claimed that other parts of the body were also menaced and could be attacked by "erysipelas, cancer or rheumatism."

It was not, however, the arguments of medicine or common sense that won general acceptance for maternal suckling of infants, but the romantic and dramatic appeal of Jean Jacques Rousseau in the second half of the eighteenth century. Rousseau's objective was to change the family and the individual, to break the shackles of the artificial paraphernalia of civilization and give natural instincts and activities full sway. Thus he was probably more influential than all physicians put together in combating the age-old custom of tightly wrapping infants in swaddling clothes. The child must be free as nature intended it to be. "Man," protested Rousseau, "lives and dies in slavery; at birth he is covered with swaddling bands; at death he is nailed into a coffin. The child's body is deformed in a press, so that rachitic, hunch-backed, bow-legged children are the result of this constriction." With similar appeal he attacked the feeding of infants by wet nurses, and the nobility of France responded to his call. Suckling even became fashionable and a sign of true motherly tenderness.

Strangely enough, the immediate results were bad and infant mortality increased considerably. This was due to the fact that the rich and noble ladies who heeded Rousseau's plea still attended to their pleasures, their affairs and parties and nursed their children irregularly and inadequately. Their poor and careless diet naturally aggravated the situation. In most cases a return to wet nursing was a boon to the child.

Throughout history wet nurses were selected with proper care and the usual meticulousness which primitive, ancient or medieval man bestowed upon all practices which he believed to be founded

upon science. She had to be between 25 and 35 years old, a mother of boys only, of which she should have raised and suckled at least two. The shape of the breast, her moral character and temperament received the greatest scrutiny, since it was believed that the latter two were transmitted to the child. While her medical history was not much gone into, it was insisted that she be "pretty and strong and have wide hips and a good complexion." Brunettes were generally preferred to blondes. Warnings against red-haired wet-nurses were frequent because their milk was supposed to be too acrid.

Since earliest times, even in the infancy of his knowledge, man believed that food influenced the body and its functions as well as his character and temperament. Hence the diet of the nurse was carefully prescribed. In case of illness on the part of the baby, medicines were often administered to the wet nurse. Her diet was intended to yield an ample supply of milk and also to protect the child from disease. The Roman physician Soranus reports that only light foods were permitted the nurse during the child's first week, while eggs were prohibited. During the child's second week of life, fish and meat were permitted the nurse but not fowl and venison. Spiced foods, especially garlic, radishes, onions, legumes, roast beef, mutton, etc., were tabooed. Nurses were urged to avoid all vegetables anyway because these were believed to dilute the milk. Pea soup, bouillon, saffron, eggs and white wine were also considered effective in diluting the milk. It goes without saying that ancient and medieval medicine had hundreds of remedies against the cessation of milk secretion. Popular measures were massaging the chest, cupping, the application of plasters made of spices, as well as powdered earthworms taken internally, fennel-seed and fennel-root. Numerous tests of equal validity were employed to determine whether the milk was of proper consistency.

It was during the second decade of the nineteenth century that a sensation was created by the suggestion of the German physician Zwierlein that a child can be properly fed without benefit of mother or wet nurse. He recommended goat's milk as a good substitute for human milk, especially if received by the child directly from the

udder. Though both practices of feeding infants by animals and from containers were known to many peoples of antiquity, Europe was shocked.

The suggestion of bottle feeding was, however, taken seriously and many foundling homes proceeded to test it. It was found that while the babies prospered on goat's milk fed from bottles during the first few months, they later began to suffer from diarrhea, which in many cases led to death unless the milk was replaced by mush.

This was due to lack of cleanliness and hygiene and to the presence of filth in the bottles and nipples employed. It was not until about seventy years ago when modern methods of sanitation and prophylaxis were employed that artificial feeding, or as it is commonly called, formula feeding, became widely and safely established.

Chapter VIII

Eggs

A common breakfast food with us are hen's eggs prepared in a variety of ways. Eggs too are an ancient and widespread food, obtained by different human groups from different sources and consumed in different forms. So far as our customs go, the source we prefer is the hen, and we eat our eggs fresh, stored or powdered. Our breakfast egg must be "strictly fresh," although for cooking purposes we may be more tolerant.

While neither chickens, geese nor ducks are mentioned in the Bible, it is known that they were widely used in Egypt, where the goose was the most important source of meat. Egypt also possessed well-developed incubators in which eggs of hens and geese were artificially hatched.

From earliest times eggs were an important human food. Generally speaking man ate whatever eggs he could obtain. Since large eggs with much yolk are produced by reptiles as well as birds, he ate the eggs of both these animal families. The Eskimos gather the eggs of ducks that visit the Arctic in the spring, eat as many as they like and bury the rest to consume in the future when necessary. When removed after months in the ground, the eggs are not fresh, of course. But what we call "bad" means little to them. Similarly, some North American tribes, the natives of Borneo, and many peoples in other regions seem to prefer eggs in a condition just prior to hatching, though they also eat them fresh.

African Bushmen and Hottentots eat ostrich eggs and use the shells as vessels to carry water in. An ostrich egg is equal in content to six hen's eggs and a nest contains about two dozen of them. The natives place one end of the egg in hot ashes, make a small opening at the other end and stir the contents with a stick.

Few are the tribes living along a seacoast that fail to gather eggs of the numerous shore and sea birds, often scaling dangerous cliffs to obtain them. In fact, the eggs of virtually every bird and every lizard are or were eaten at some time by some human group. So, for that matter, were practically all birds and reptiles themselves. Our own customs dictate that we obtain our supply of eggs from birds raised and kept for that very purpose. At that, our choice is very limited since we make little use of the eggs of any other fowl besides the chicken.

Primitive groups, however, got their eggs mainly by gathering them wherever they could be found. But collecting eggs was practiced on a large scale when people learned to observe the nesting habits of birds, which would arrive at a specific time at a given place to lay their eggs. Thus in a few days the natives collect as many as 24,000 eggs of penguins and gulls on small Dassen Island off the Cape of Good Hope and sell them at Cape Town at one cent apiece.

In some sections of the East duck eggs pickled in brine are popular. The Malayans salt them as they do their meat. The Chinese mix a red, oily clay with the brine to block the pores of the shell. After keeping them in this mixture overnight, they dry the eggs in the sun the next day and half roast them. In this condition they are well preserved.

In some countries hardboiled eggs are shelled and pickled in earthenware jars with hot vinegar which is well seasoned with whole pepper, allspice, ginger and garlic. When the mixture cools, the jars are closed and the eggs are permitted to remain there for a month or so after which time they are regarded as a delicacy.

The eggs of the emu, cassowary, woodcock, and many other birds are also eaten. But besides domestic fowl, it is the aquatic birds that contribute most eggs to the human diet because these birds gather in large numbers and lay their eggs on islands or beaches where large-scale collecting is possible.

In 1858 San Francisco saw the formation of a company that gathered eggs of sea birds on the Farallones de los Frayles, a group

of rocky islets, lying about twenty miles west of the entrance to the Bay of San Francisco. In that city alone there were sold in that year, during the season lasting about seven weeks, more than five hundred thousand of such eggs gathered on only one of these islands, and the number gathered was only a fraction of the total available.

The eggs of penguins, cormorants, albatrosses, terns, gulls, petrels, pelicans, and gannets are also gathered assiduously and consumed and sold widely. The eggs of sea birds "are the chief and favorite native food" of the Easter Islanders. The egg is the symbol of their highest god.

We are so habituated to the consumption of birds' eggs that we regard the eating of reptilian eggs as wholly queer and barbarous. Yet, these are highly favored by many human groups. Turtle eggs are eaten in South America by natives and Europeans. These eggs are globular in shape and protected with a thin calcareous shell. Some people eat between two and three dozen of them at one meal. The eggs are somewhat oily but savory. They are also salted and barreled for shipment. The white portion never coagulates and is discarded, the yolk alone being eaten. The Indians eat them raw and mix the yolk with tapioca.

The eggs of millions of turtles are deposited along the shores of the Orinoco and are gathered by the Indians, who extract an oil from them called mantega. This oil they preserve in jars for trade and foreign shipment. It constitutes a large industry. The eggs are broken and stirred with shovels in troughs of water, and the mixture is exposed to the sun until the oily part of the yolk floats on the surface. It is then collected and boiled. It is used as fuel in lamps as well as seasoning oil in food. If it is not prepared quite pure, it may become somewhat putrid, which the consumers do not seem to mind.

The eggs of the lizard, iguana, are considered a treat by gourmets. These have yolk that does not harden on boiling and contains very little albumen or egg white.

Even eggs of alligators and crocodiles, some of which resemble fully the hen's eggs, are eaten. Egyptian records tell of a gentleman, famous for his breeding of different types of birds, who happened

to find a strange and attractive egg as he walked along the shore of the Nile. He took it home and it hatched. It proved to be a crocodile which after hatching promptly devoured all the chickens on his farm.

Raising crocodiles was not indulged in by the Egyptians though they were highly experienced in the technique of artificial incubation. It seems that they limited their art to hens, ducks, and geese. Nor were alligator eggs eaten in Egypt. The eggs of numerous species of South American alligators are, however, eaten to this day.

We all know, of course, that the eggs of fishes are considered a great delicacy. The eggs or roe of the rare sturgeon of the Caspian Sea are salted and appear on our tables as caviar. The red eggs of the salmon are now similarly treated and enjoy a good market.

But the saying, "One man's meat is another man's poison," is true particularly of food which man singles out for special attention or favor. Just as milk or meat were exceptionally cherished items with some peoples and tabooed foods with others, so did eggs become the subject of extensive prohibitions virtually all over the globe.

Strange prejudices have surrounded the eating of eggs almost everywhere. In India they are prohibited to the higher, hence purer, castes together with all meat, fish and blood-containing foods. Sects or nations seem to have existed everywhere in the Orient who abhorred eating anything that had to be killed. We are not the only ones who taboo turtle eggs. Many native tribes such as those of the Pacific Islands were very strict on this point.

With the ancient Greeks a man who would be pure had to abstain from eating all eggs and animals that laid eggs. The Bible commands Jews to abhor blood as food and any egg that has the minutest blood speck on the surface of the yolk cannot to this day be eaten by the orthodox.

Complete prohibition of eggs prevails in many parts of Africa, Asia, America, the Pacific Islands and elsewhere. In large areas scattered all over the world, the prohibition is only partial. In some cultures of Africa or Australia eggs are prohibited to girls before puberty who then taste them for the first time amidst elaborate cere-

monies as part of their initiation rites. Among many tribes of these two continents, boys before circumcision and girls before puberty may not eat them. Elsewhere the case is reversed. Boys and girls before their initiation rites, the equivalent to our confirmation, are allowed to eat them freely but cannot afterward. In the latter case young boys and girls are considered free and irresponsible, hence, not obliged to obey the weighty laws of God and nature. When the reverse custom prevails, it is believed that initiation entitles them to mature and serious food.

There are many tribes, like the Ganda of Uganda, in which the eating of eggs is prohibited to women only. In some cases women who touch or break eggs are punished with death. Prohibition of eggs to women seems widespread in Africa. Even the Samoans, who eat dogs, despise eggs and chicken. Similarly, the Witoto of Brazil, who eat rats, mice, frogs, lizards, snakes and turtles, eat the eggs of reptiles but despise those of birds.

As in the case of other customs, concrete and pseudo-scientific reasons were always advanced, even as they are by some people today, for whatever prejudice happened to prevail. Some tribes did not eat eggs because their neighbors who were uncircumcised ate them, or vice versa. Others claimed eggs had "a weakening effect upon the organs of generation" because of their resemblance to testes and some, as we have seen, because they were the seat of life.

Eggs also played a role in religious ceremonies, ritual, and superstitious practices. They are still used in ceremonies to cast out the Evil Eye, as a sacrifice to various spirits, or as symbols of hidden meaning. All these point to their ancient recognition as an important item of diet. It is well to bear in mind, however, that whatever views ancient or primitive man maintained for or against eggs were based upon his particular explanations and beliefs. We know today that these belonged entirely in the realm of superstition. Yet the very act of thinking about the problem, the very idea of calling attention to it, of raising the question and suggesting any kind of explanation at all, is an activity we may well designate as the beginning of science and philosophy. For this reason, all of these beliefs and superstitions

are nothing but the scientific speculations and philosophic efforts of primitive man.

The groping of modern science rests at least on a far more secure basis, on carefully planned experiments and on a greater distinction between facts and fancy. Modern science has a different story to tell about eggs and their value in the diet.

It is common knowledge that eggs are produced in the ovary and can reproduce the types of their respective species. The germinal area forms as a small mass floating on top of the yolk. This will give rise to the cells that multiply and spread to form ultimately the chick. The rest of the yolk is merely food for the growing embryo. It takes twenty-one days for the egg to evolve into a living chick and the processes of development require energy and materials supplied by the yolk. The egg white consists of layers of protein deposited upon the yolk as it moves down the duct from the ovary. The last to be deposited is a calcareous secretion which forms the hard shell.

It can be seen that the hen's egg resembles somewhat the berry of wheat. The minute germ of the grain gives rise to the new plant while the bulk of the berry consists of starch intended to nourish it until it is advanced enough to subsist by itself.

Since eggs must give rise to a full-fledged organism, it is not surprising that their yolks are extremely rich in minerals, such as phosphorus and particularly iron, practically all of which is in a form which the body can easily absorb. We have seen that milk, perhaps the most valuable of protective foods, has a weak spot in its shortage of iron. But while eggs have a far richer supply of iron, they have less calcium proportionately than milk. The young chick gets its calcium from the eggshell. But eggs also have a good supply of phosphorus, a mineral which is as badly needed in the formation of bones and teeth as is calcium.

So far as vitamins are concerned, eggs are about as rich and varied a source as can be found. As stated, they are a bundle of materials for life, since out of a hen's egg emerges a full-grown chick. No wonder, then, that eggs contain all vitamins but C, the

one obtained from fresh and canned fruits and vegetables or their juices. There is also an abundance of vitamin A, also found in butter and carrots, so important in night vision, growth and health.

Eggs form an excellent source of the several components of the vitamin B group. Vitamin B_1, or thiamine, is the vitamin of whole grain and cereal. The B group of vitamins also consists of riboflavin, niacin, the component which prevents pellagra, B_6 or pyrodoxine and others. Each one of these components of the so-called vitamin B complex has its own dramatic story of discovery, preceded by suffering and death to millions of victims until science groped its way to a solution. Now that science has conquered the vitamin-deficiency diseases, the past terror vanishes even from our memories and we give the erstwhile dreaded menace no more thought. The fear and tragedy of generations are dismissed with the simple statement that without that component in our diet, dire consequences to health ensue. It is all very well to be so concise but it is also useful to think of past suffering and struggles lest we forget and lest we fail to appreciate, guard and put into practice the valuable benefits derived from these discoveries.

Besides, eggs also contain the precious sunshine vitamin known as D. Of course, so long as we can be exposed to the sun, we do not worry much about it, but there are few foods besides fish-liver oils that contain it, and egg yolk is one of them.

In addition to the minerals and vitamins already mentioned, eggs have, of course, great value as sources of essential proteins and energy. The bulk of their substance is composed of proteins. These are complex chemicals built of smaller units, much as a chain is made up of links. These units are called amino acids. They are indispensable to the maintenance of our bodily tissues and structures, since most of our muscles, nerves and glands consist of proteins. Some of these amino acids, or building blocks of proteins, act in every way as vitamins. They are essential in minute amounts to the proper functioning of the body and cannot be synthesized by it. This means that our bodies must obtain them from other plant or animal sources even as we must get our vitamins. It is for this reason that

an exclusive starch or carbohydrate diet is detrimental to health and welfare. Some protein is essential. Not all proteins have all the needed amino acids, in which case it is essential that we eat a generous variety of these substances and include those, called primary, which can supply all the amino acids our body requires. From this point of view eggs are extremely valuable in our diet. They are a protective food not only by virtue of their minerals and vitamins but also by virtue of their first-class defensive proteins.

Egg white is the least important part of the egg. It is the yolk that contains all the minerals and vitamins and the desirable proteins. Both, however, egg white and yolk are very digestible.

Egg yolk also contains fats and oils which are an excellent source of energy. One ounce of fat supplies more than twice the energy yielded by one ounce of sugar or protein. A normal egg yields about seventy calories. The total per day should be about 3,000 calories for a person of average activity. Of the egg's seventy calories, only about ten are yielded by the egg white, which consists almost exclusively of the protein albumen.

It should be noted that cold storage eggs, if stored when in good condition, are nutritionally as good as fresh ones. Powdered eggs also need not lose any of their nutritional virtues in the course of preparation. In both cases, however, taste and flavor enter most significantly into the question of comparative values.

Next to milk, eggs are our best protective food. Like milk, they lack vitamin C, supplied by fruits and vegetables. Hence, any human group which consumes sufficient amounts of milk, eggs and fresh fruits or vegetables alone cannot go wrong nutritionally and will surely produce a healthy and vigorous race. Eggs must, therefore, be included in our daily diet so that each one of us consumes at least four of them weekly.

We like our eggs fresh. When they are aged, they may be on the road toward the development of an embryo if they have previously been fertilized. To protect the consumer, many States demand that no roosters be kept on farms that raise hens for egg laying. Deteriorated or spoiled eggs encountered on the market are usually due

to bacterial action. Normally, eggs can resist contamination because the white contains a substance which kills bacteria. But careless and improper treatment may aid the germs in becoming established, and decomposition may then set in. Owing to the high nitrogen and sulfur content of egg proteins, gases containing these elements are given off. These happen to have the unpleasant odors that indicate spoilage.

The older the egg, the larger is the air space at its broader end. When an egg is first laid, that space reserved for gases is very small. due to bacterial decay, areas within the egg develop dark spots, besides giving off gases.

Eggs can be tested for freshness in a very simple way. In the past they were laid on their sides in a pail of water. If they were fresh, they stayed put and if not, they stood on their small ends because either the decomposition or development which had taken place led to the production of gases which enlarged the air chamber. The floating tendency of this air chamber at the broad end causes the egg to stand on its point.

The modern testing method is that of candling. In a darkened room the egg is inspected against a light or candle. If fresh, the albumen is clear and translucent, and the light shines through it with a reddish glow. If decomposition has set in, dark and opaque areas will be seen.

For use on ships eggs were carefully protected before the coming of refrigeration. They were smeared over with oil or grease and packed in jars filled with bran or sawdust to keep all air and oxygen out. Without air, there will be very little decomposition. The jars were then cooled and sealed and put into a vessel of hot water. Such eggs were good for six months. Nowadays they are well protected by being placed in water glass where they can remain for many months in good condition. With modern refrigeration and cold storage transportation, fresh eggs are daily available.

Chapter IX

Meat and Fish

There can be little doubt that primitive man availed himself freely of meat from a vast variety of animals about him which he could capture. No generalization can be made about the early evolution of his diet, whether he first was carnivorous and then vegetarian or the reverse, because no such regular sequence pattern seems to exist. It is not permissible to say that man first subsisted on meat and then in the course of time learned the art of collecting or cultivating roots, fruits and vegetables or vice versa. As we have seen, customs in diet become established just as firmly as any other customs or institutions, and, similarly they assume their final forms for a multitude of reasons. Like other customs, food habits once established become traditional and can persist for many generations, defying all attempts at change, no matter how justifiable. It is also a fact, however, that in spite of inevitable resistance, some changes do take place. Not always are these changes of a desirable kind.

As we have already seen, some primitive tribes became mainly meat eaters, others subsisted almost exclusively on milk, and still others on agricultural products. These diets, no matter how established, become in time firmly rooted and traditional and just as difficult to change as are language, religion, social relationships or race prejudices. And yet, chance might easily have produced at the beginning one set of habits as well as another, which fact is little consolation indeed. Chance for example might easily have made a given woman the mother of a boy or a girl. But once it is established that the child is of one particular sex, it is in this case impossible, and in other chance-determined instances very difficult, to effect a change. The same is true of diet, within the limits of the analogy. Hence, the concept of a regular pattern of evolution from meat to vegetables

or in the reverse order is just as false as past notions of a regular pattern of social evolution from stage A to stage B to stage C and so on. The development of societies is more complex than human naïvete presumed.

It would seem, however, safe to say that meat is, or at one time was, eaten by practically every human group. Records indicate that wherever there exist prohibitions against meat, as among the Brahmans and other groups, these prohibitions usually came to populations that had eaten meats. Yet, similar taboos may have had different origins. Sometimes a religious prohibition merely sanctions a long-established custom. But often religious satisfaction is obtained from self-denial of something desirable as is typified by Lenten sacrifice. In other cases religious authority merely takes sides in conflicting trends, dooming one tendency and giving sanction to another.

Ancient Greece is a good example of such a situation. As was mentioned in the last chapter, there was a tendency to regard the eating of blood-containing substances or any animal matter as polluting. But while it became a law in India, it failed to get final sanction in Greece and never became established. In other communities some priest or medicine-man conceives the idea that a certain food should be declared impure. He wins a few followers and, as in the case of the prohibition movement in our own country, before one knows what is happening it becomes law. While a democracy permits repeal, change never happens in that manner with custom or religion. Change does take place, but slowly and irregularly and, more often than not, in an uncontrolled way.

But to return to the subject of meat. All excavations of primitive camps or firesites contain chewed bones of animals among the debris, thus indicating that our immediate manlike ancestors ate meat. Famous are the excavations in the caves of Spain which had remarkable paintings of bison or cows on their walls. These were not put there to decorate the dark home but to invoke the aid of the gods in the hunt to come. It is very likely that the tribes or nations which at present do not indulge in meat eating at all are merely societies in

a transient stage. In all likelihood, their ancestors at some time did, and their descendants at some time will, eat meat.

Certain it is that man in general was far bolder, far more catholic and experimental in his quest for meat foods than in his dietary utilization of plant food. His vegetable sources of food were always limited. Until recent years man ate few vegetables indeed besides such grasses as wheat, barley or rye. On rare occasions he ate fruit, more frequently cabbage, leeks and onions. Herbs were also used but mainly for seasoning or medicine. But primitive man's record is far different with regard to meat. There are very few animals that man did not use as food. Monkeys, carnivorous and herbivorous four-legged animals, snakes, reptiles, turtles and frogs, birds of all kinds, all fish of rivers and oceans, sea mammals, insects, spiders, shellfish, clams and cuttlefish—in fact, everything living was eaten whether it walked, crawled, climbed, flew or swam. Speaking of the human race as a whole, all flesh was eaten regardless of the appearance, nature or habits of the animal. And why not? Biologically speaking, all flesh is much the same and no matter what the animal looks like and what one thinks of it, once it comes to be regarded as edible, its flesh is meat. All flesh is much alike since it is all composed largely of protein, some fat, and connective tissue which is hard to chew and is nutritionally worthless.

There are, of course, considerable differences in flavor between the meats of different animals. But in view of the fact that our detection of flavor is very delicate, this is not surprising. Flavor is the product of the action of some chemical substance upon the taste buds of our tongue and the sensation of smell, which is the result of the action of molecules in the gaseous state upon the sensitive area of the nose. Both sensitive regions become stimulated and relay the impulse to the brain. Differently constructed chemicals produce different responses, hence we experience different tastes and smells and consequently different flavors.

Now, proteins in nature vary widely, more so than any other group of substances. As already stated, proteins are composed of chains of smaller molecules called amino acids. There are some

twenty odd of these already known so that they obviously permit of many combinations. For this reason practically no two proteins are alike in structure and taste. Beef even differs from veal and mutton from lamb.

Speaking scientifically, all flesh is meat and all meats are more or less equally nutritious if properly cooked so as to kill any parasites that may be lodged within their tissues. But then one of our most favorite meats, pork, was and still can be the most dangerous menace on this score as the carrier of tapeworms and trichinae, the parasitic flatworms, which if swallowed by man lead to prolonged and annoying illnesses. Aside from this menace, however, we need not be particularly astonished at the fact that man had at some time, in one region or another, consumed the flesh of any animal he could obtain. In the long run, protein is protein and taste is both relative and a matter of habit, custom, and emotional predisposition.

We have already seen that one man's delicacy can be another man's abhorrence. Thus, the Greeks, Romans, Aztecs and hundreds of other groups all over the globe relished dogmeat. The great medical leader, Hippocrates, praised it as light and wholesome food. It is still considered a delicacy in China, Africa, Australia, and elsewhere. South American Indians favor monkeys as well as turtles, lizards and alligators. Lions and hyenas are eaten by some Arabs, and tigers by Malays. Field rats and mice enjoy wide popularity on many continents, and so on down the line, with hardly an animal left out.

Man's courage in including the meats of all kinds of animals in his diet was not so much the result of necessity as the product of his belief that meat imparted to the consumer the qualities and virtues of the animal from which it came. It is for this reason that tigers and lions were eaten. It is also for this reason that glands and organs were highly valued. Heart, liver, kidney, pancreas, sex glands, brain, tripe, chitterlings and the like, all highly nutritious and rich in vitamins, were believed to be the seats of some quality or emotion such as bravery, compassion, potency or wisdom. They were

eaten for the virtues they were believed to impart. So highly were these organs regarded that in many cases they were set aside for the chiefs and priests while the commoners were obliged to eat steak and other muscular meat.

This widespread belief of primitive man that food imparts its virtues to the body may certainly be termed a superstition. Yet, it contains within it a considerable amount of truth. It is primitive man's scientific way of suspecting that people are affected by the food they eat. For a while even modern science failed to stress this point. Quite naturally, primitive man could not see all the truth or even a goodly fraction of it. The true essence was invariably hidden in fancy and false guesses, which in the course of time came to be replaced by new ones. The old beliefs would then be called superstitions. But it is important to remember that these superstitions are worthy and fruitful attempts at scientific explanations though proven later to be off the mark.

It should be borne in mind that this general assumption of the transfer of properties from the food to the consumer gave rise to many valuable medical practices. All kinds of herbs were eaten or their juices extracted for various cures. Mineral waters were drunk, curious animals and tissues were eaten amidst magic and ceremonial and even minerals and chemicals consumed. In this way, though for fanciful reasons, many lucky strikes were made.

It is also of interest to note that man often ate animals which should be classified as pests such as grasshoppers, locusts, beetles, ants, lice, termites, and various kinds of caterpillars. This was rather clever though now viewed by us with disdain. As we saw in an earlier chapter, the custom of eating some of these insects was so well established in Biblical times that the religious lore of the Hebrews incorporated it in its writings. In our society the eating of a grasshopper makes the front page of the press. Recently, an American aviator was downed in the jungles of Australia where he starved for days and finally ate a grasshopper. It tasted good, he said, somewhat like crabmeat. He would have been better off had he eaten more of them. They are still eaten as a delicacy by millions in Asia and

Africa and were eaten on this continent by many North American Indians.

We are now in a position to understand the opposite side of the picture, why simultaneously with such extensive and bold utilization of all kinds of animal foods, man also developed a most bewildering conglomeration of prejudices and superstitions. Meat as food is surrounded with more prejudices and taboos than any other food item. Thus, beef is prohibited to Hindus, meat of all kinds to Brahmans and many Buddhists, pork to Mohammedans, Hindus, Jews and millions belonging to other groups, and fowl, game, horsemeat, dogmeat, mutton, many species of fish, whole families and orders of animals are taboo or an abomination to numerous human societies. There is, in fact, no single meat source which, though highly favored by some group, is not regarded as objectionable by others.

The force with which an aversion or a prohibition is rooted in the mentality of a people or in its philosophy can best be demonstrated by the following quotation from an American author who spent much time in India recently. He writes: "No less a person than Mahatma Gandhi loves and adores this animal (the cow) more than self-government. Cow protection, he says, is the gift of Hinduism to the world. And Hinduism will live as long as there are Hindus to protect the cow."

But it so happens that to the poorer Mohammedans beef is almost a staple food. In addition, the Koran requires that at certain religious festivals an animal be sacrificed in memory of Abraham's act of sacrifice. Indian Mohammedans insist on sacrificing the cow, which act the Hindus consider an outrage and a defiance. The killing of a cow even by negligence was legally punishable by death until recent years. Strangely enough, the Mohammedans of other areas sacrifice a sheep or a goat.

The author cited above discussed Hindu-Moslem unity with a Mohammedan leader. He read to him Gandhi's statement, "My prayer ascends daily to God Almighty that my services for a cause I hold to be just may appear so pleasing to Him, that he may change

the hearts of the Moslems, and fill them with pity for their Hindu neighbors and make them save the animal the latter hold dear as life itself."

The Moslem leader was much moved. After explaining the importance of the holiday and the sacrifice, he pointed out that "in Turkey, Egypt, Syria and Persia where a cow may be sacrificed without offense to anyone, a sheep is preferred. The preference for the cow by the Indian Moslems can be explained by the simple fact that the goat and sheep are much more expensive in India than the cow, and the Moslem cannot afford the price of a sheep." Whatever the truth, it is clear that food and fancy play a major role in this great tragedy of a nation. There are also numerous and particularly strict rules regarding the mode of preparing meat. Orthodox Jews and Mohammedans would rather starve than eat otherwise permissible meat unless the animals were killed and prepared according to the law. Many customs or religious rules permit the eating of certain parts of the animal and prohibit others. Often only one sex of an animal may be killed and eaten. Then there are rules among Jews and many African tribes, that prohibit the eating of meat together with other foods such as milk or vegetables, or the keeping of food in metal containers. Eskimos, on the other hand, have strict rules against eating seal and deer meat on the same day. The prohibition even extends to the eating of seal while bones of deer are about. For that matter the utensils and dishes used for deer may not be used for sealmeat and vice versa.

Often all meat or only the meats of some animals are forbidden to boys and girls before puberty. In some cases the reverse order operates with restrictions imposed on individuals past puberty who are regarded as full-fledged and responsible members of the tribe. Prohibitions of some meats to women or to men only is also quite common. Even the time of day for meat eating may be prescribed by custom.

Occasionally history provides us with an interesting exception in which a conscious effort is made by a human group to bring about a revolution in its diet. As in the case of social revolutions such a

change may occur for diverse and many reasons, both intentional and incidental. Also, as in social revolutions, the degree of change is not as vast as is usually imagined, but the new flows from the past and is fully a part of it except for minor aspects. Thus Herodotus recounts as follows: "The people of Marea and Apis in the part of Egypt bordering on Libya, deeming themselves Libyans and not Egyptians and being discontented with the restrictions concerning victims, were desirous not to be restricted from the use of cows' flesh and therefore sent to the god Ammon saying they had no relation to the Egyptians because they lived out of the Delta and did not speak the same language with them; and they desired to eat all manner of food." The god refused, however, on the fairly reasonable ground that all territory irrigated by the Nile was Egyptian, and that all people who lived below the city of Elephantine and drank Nile water, were unavoidably Egyptian.

It is doubtful whether we have here an instance of a rational rebellion against an oppressive dietary custom. Would we as a nation suddenly rebel against the social prohibition upon the meat of horses and dogs? Will India suddenly awaken to the folly of proscribing beef and will Mohammedans and Jews decide en masse to favor pork? These events are not likely to happen. A custom, like dogma or tradition, acts like a belief trap. Its victim is comfortable in his captivity and resists change as unnatural, objectionable and unnecessary. Logic and reason will be enslaved to the belief rather than the masters of it. In fact it is this feature which is man's toughest obstacle to progress.

We all know, of course, that change does inevitably and universally take place, but the way it happens is most devious, often unpredictable and at times accidental or rather incidental. In the case of the Libyans it would seem that the beef prohibition was a foreign importation imposed upon these people by Egypt. The appeal to Ammon was an expression of a desire to return to tribal custom, probably under the influence of a Libyan Elijah who preached a return to the ways of their ancestors.

In our society meat is regarded as a most desirable dish and

abstention from it as a form of self-denial. It is very likely that the same attitude prevailed elsewhere and that some meat prohibitions might have originated in this manner. It is, however, reasonable to assume that other prohibitions derived from the habit of subsisting entirely on vegetables and fruits so that meat, as a strange and remote article, came to be unwanted and tabooed.

There are, however, cultures subsisting almost exclusively on vegetables but, like the Japanese, will take to meat as soon as they can afford it. While the poor peasants of Japan live almost exclusively on millet, barley, soybeans and rarely on rice, which is more expensive, they promptly take to meat as soon as they get richer. This trend may express a natural reaction but it may also be due to fashion. Since 1867, Japan has striven most assiduously to imitate America and Western Europe in every respect. Before our country ever gave a thought to the diet of its people, the Japanese government, eager to acquire the science of the west, began an intensive study of the nation's food habits with the desire of improving its health. Records show that after contact with America and Europe, meat-eating began to gain favor with the wealthy. This tendency may be sheer fashion or imitation, as Japan tried to imitate in every other respect for purposes now made clear. In India where the habits of the British necessarily set the fashion, there was no such trend on the part of the Brahmans. But in Tibet, where the killing of animals is prohibited, a way out is found. The animal's death is brought about indirectly and its meat eaten after proper prayers and apologies. Man creates obstructions but is often also clever at tricky evasions.

On the other hand, it should be borne in mind that many vegetarian tribes and peoples subsisting on milk alone do hold meat in high esteem. The milk-drinking Bantus, the Bedouin, and Kirghiz do eat some meat on holidays and festive occasions. Even high-caste Hindus may eat fish or goat-meat if the day is converted into a religious occasion and the act of eating into a form of participation in a divine offering. This would make it seem as if some excuse is invented so as to satisfy a desire for some meat. Yet, there is abundant

evidence that cultures, like many individuals, can be fully pleased with a vegetarian diet and would show the usual resistance to any effort at imposing meat upon them. Whatever the true explanation, it remains a fact that the importance of meat in ritual, in taboos, in the numerous laws regarding its preparation and also purification, bespeaks the reputable place meat occupied in primitive man's diet and in his thoughts about food.

Man's complex attitude to meat can be understood after some reflection. To us, meat comes in slices, packages and cans. Hence, our attitude is purely matter of fact. But primitive man obtained his meat from animals which he knew intimately whether he hunted them frequently or not, about which he had spun fantastic tales that he believed in, and that constituted his science. To him animals had personality and certain virtues and powers which were lodged in their flesh. Eating was not putting food into a stomach where gastric juices and hydrochloric acid attack them and whence the contractions of the smooth muscles propel them along the intestine, etc. Such knowledge naturally colors our attitude to food and makes it practical and unromantic.

But primitive man had different knowledge. So far as he was concerned, he merged with his body the meat of a cow or a hippopotamus which, to begin with, were not mere animals to him. They were either holy or noble, villainous or sly, but in all cases, individuals with complex powers and histories, standing in unique relations with man and the gods. Thus, the problem of eating their flesh was reduced to a conflict between man's desire for meat and his varied beliefs about the animals that could supply it.

We too show such attitudes with regard to some animals. Consider the case of horsemeat, for example. Surely we like meat and we like saving money. Yet, both these factors, together with the force of propaganda, the great prestige science enjoyed in the nineteenth century, and the fascinating personality and popularity of the particular scientist who conducted the campaign, failed to advance the cause of horsemeat eating.

The eminent French zoologist, Isidore St. Hilaire, sponsored this

noble cause, arming himself with scientific evidence and reformist fervor, braving ridicule, complacency and prejudice. He pointed to its past record as a food much relished by the Germanic tribes and still cherished elsewhere by Negro, Mongol, Malay, American and Caucasian. He praised its flavor and wholesomeness, performed numerous experiments to prove it, gave impressive banquets where it was served in all kinds of dishes—yet all in vain. The campaign gained the approval of many authorities. Its use as food was even endorsed by a prominent New York newspaper. Yet, as we know, all these efforts failed of the main objective. The sale and consumption of horsemeat did spread from France to Germany, Belgium and Switzerland, but only small sections of the population took to it. A campaign for pork eating among Mohammedans, Hindus or orthodox Jews would, no doubt, have less effect and would lead to much bloodshed of humans rather than of pigs.

Whatever animal primitive man obtained his meat from, he invariably hunted by extremely clever methods. In our enthusiasm over current inventions, we fail to appreciate the ingenuity of primitive traps and the skill and courage required in successfully attacking wild herds with spears. Moreover, the manner of hunting each animal was suited to its nature and weaknesses.

Similar inventiveness was displayed in the preservation of meats so as to save them for future use. We are all familiar with smoked, salted and spiced meats which could last for months, or with the pemmican of the buffalo-hunting Indian tribes of North America. Buffalo meat was cut into strips, dried in the sun on special frames and browned over the fire. This dried meat was pounded into a powder, stuffed into cleaned intestines and sealed with melted fats. Often the ground-up meat powder or pemmican was mixed with dried fruits, berries or cornmeal. It could then be cooked, fried or stewed.

A favorite still with Latin America is jerked beef which is slightly affected by bacterial decay. It is known in Cuba as tasajo or in South America as charqui or sesina. It consists of lean beef cut thin, exposed to the action of bacteria overnight and then salted and dried in the sun.

Generally speaking, smoking, salting or drying of meat was made use of everywhere. Familiar to us is the meat-biscuit used in the American navy in the early decades of the last century. It is made of boiled beef freed from fat, dried and mixed with wheat flour to form a paste. This is spread thin by a rolling pin, cut into pieces, baked and dried.

Blood is prohibited by some customs or religions but is also drunk elsewhere or prepared as solid food. The Masai are very skillful in tying the vein on a cow's neck, shooting an arrow into it which is provided with a bar to control penetration, and in collecting the blood. This they drink with great relish. The animal is bled often but never more than once a day. Other peoples convert blood into a pudding or soup to which other components are added. The American aviator who starved on a raft in the South Pacific acted very wisely when he grabbed the gull which alighted next to him, wrung its neck and drank its blood. Blood is the body's fluid transportation system. It contains its minerals, nutrients and some or all of its vitamins, though in minute amounts.

That an exclusively meat diet can maintain life and health is, of course, proven by the Eskimos. The Arctic regions which they inhabit provide few plants, roots or fruits, and the Eskimo diet consists of the meat of the seal, whale, narwhale, walrus, aquatic birds and their eggs, and such land animals as the bear, fox, seal, deer and others. Some tribes do not eat shell fish except when found in the stomach of animals. In fact, because they eat chitterlings and all the organs of their animals, they also obtain much vegetable food. Not only do they eat the entrails but also all the organs. Most of the meat is consumed raw and what is not eaten at the moment is frozen and cached for the future. It is not so much cooking as thawing that is their problem.

A favorite with Eskimos is blubber or the fat of their aquatic mammals. They consume it in large quantities and use it also as fuel to light their homes. The blubber fat is also used as a medium for pickling birds or other meat articles. The blubber is melted into an

oil and allowed to soak into the meat. The following winter the meats freeze again and are eaten either frozen or thawed.

The nutritional value of muscle meat consists chiefly of its supply of protein and some iron and traces of other minerals such as copper. The latter is needed because it has been found that without it iron is not used by the body to produce the essential red blood substance. Yet, its acquisition need cause us no worry because the body requires it in minute traces which it easily gets in fruit, vegetables, meat or bread.

The value of proteins has already been pointed out in our account of eggs. The meat proteins contain all the amino acids and are excellent for the repair and maintenance of our bodily tissues. Muscle meat also contains some carbohydrate and fat for energy, considerable amounts of vitamin B_1, and the other components of the B complex. It is rich in phosphorus but deficient in calcium. It is not a very good source of the other vitamins besides the B complex. Its main virtue lies in its proteins which have very high biological value and are a desirable supplement to any vegetable proteins.

When, however, the glands, brains, entrails, and inner organs are consumed as well, then the vitamin supply of meat rises considerably. Moreover, these organs and tissues, if properly cooked, can supply every vitamin and mineral needed with the exception of calcium. It is for this reason that the Eskimos manage well on a meat diet. Raw liver contains vitamin C which can be obtained by us only from fruit and vegetable sources. This vitamin can also be obtained from the vegetable remnants contained in the stomach and entrails. They are considered a delicacy and are known as chitterlings. Vitamin A of butter and such yellow vegetables as corn or carrots is abundantly present in liver and other organs. In the organs can also be found all the elements of the vitamin B complex and even vitamin D, the sunshine vitamin. Thus, animal tissues properly prepared can supply all the protective vitamins the body requires so long as these tissues include all organs and glands. The Eskimos do, however, add some berries and plants to their meat diet.

The explorer, Stefansson, has recently claimed that polar bears, wolves and Eskimos do not make much use of the organs and glands of their prey and that their source of vitamin C is unaccounted for. He therefore disagrees with those who argue that the reasons for the Eskimos' good health lies in the fact that they do not limit their meat diet to muscle meats but consume the glands as well. Stefansson claims that the Eskimos eat mainly the fat and lean meat, that they refrain from using the blood and give the organs of the captured animals to the dogs.

It should also be borne in mind that Stefansson has lived on an all-meat diet exclusively for over a year and fared very well, showing no signs of vitamin C deficiency. His contention that the source of vitamin C supply in the Eskimo diet needs greater study is well taken. We may, however, regard it as certain that vitamin C is needed by the body, that muscle meat is not a good source of it, but that the glandular organs and chitterlings are.

The consumption of brain, heart, kidney, liver, spleen, and other organs becomes, therefore, an important dietary goal of our times. By discarding these organs we throw away practically all of the animal's vitamins and minerals just as we lose the most valuable substances of vegetables by discarding the water in which they have been cooked for long periods. The prejudice against liver was overcome when it was discovered that this vital organ was rich in iron, an aid in preventing pernicious anaemia. This is a hopeful precedent. If it can be done with liver, it can also be done with the other tissues which are equally valuable.

Regarding our attitude toward the consumption of the glandular tissues, we are in the same position as those primitive peoples that relish turtles or field rats and condemn eggs or milk. To the scientist we seem equally irrational and superstitious, if not more so, since we have valuable scientific information at hand and, unlike the natives, should be able to relinquish our prejudices.

This does not mean that muscle meat, roasts, steaks, and chops should be abandoned. Far from it. Their savor and prestige alone, aside from their value as first quality proteins, would justify a promi-

nent place for them in our diet. Yet, if we could extend our diet to include the glandular organs, we would make great progress.

It was believed at one time that the proteins of food were incorporated as such into the tissues of those who ate them. This is not so. All proteins are broken down in the stomach into their amino acids. These are absorbed into the blood stream and carried to all cells where they are reconstituted into the proteins which compose these cells. Of the total of about twenty-three amino acids known so far, ten or eleven cannot be synthesized by the body. Yet, they are badly needed in the repair of our tissues. These must be supplied directly and meat proteins are a good source of these vitamin-like amino acids.

It should be remembered, however, that a mixed diet of vegetables containing proteins, such as legumes, would in all likelihood supply all the essential amino acids required by the body. It is true that no single vegetable has a sufficient variety of proteins to supply all the 10 or 11 needed. Most vegetables that contain proteins do not have primary protein mixtures, which means that most vegetable proteins lack one or more of the essential amino acids. Experiments have shown most vegetable proteins to be secondary in nature.

For this reason, whenever people rely on vegetables alone as their source of proteins, it is desirable that they should eat as many varieties possible. Tests with laboratory animals prove that a diet of soy beans, cotton seed oil and peanuts or their products maintain health and growth about as well as meat. It is claimed by many, however, that in spite of an ample supply of proteins from many types of vegetables, occasional meat consumption is desirable, even though only once a week.

A considerable part of our proteins comes from cereals. Some of these proteins, such as those in rice, happen to be of a very high quality, but are unfortunately present in quantities too small to rely on.

Proteins are not primarily energy-yielding materials. They are the substance for maintenance and repair. It is starches, sugars and fats that are essential fuel for energy. Hence, meat is not so vital

for those who perform hard labor as is a supply of energy-yielding materials.

The meat of fishes is somewhat like the meat of land animals and consists chiefly of proteins and some fat. In the beliefs and practices of people, fish like meat was subject to all kinds of fears, prohibitions and taboos. The Bible permits the use of only those fishes that have fins and scales. There are tribes that abhor and forbid all fish and others that prohibit them only to women. Often fish are tabooed to tribes that live on the shores of seas and lakes. With other human groups, fish may be a highly desirable staple food.

In ancient Egypt many species of fishes were eaten, but none were consumed by the priests. In addition, some fish were not eaten in certain localities and were considered holy. As a result they were buried like other sacred animals in special cemeteries. The Sudanese king, Piankhi, would not admit in his presence Egyptian messengers who had eaten fish. This alone proves that the Sudanese considered fish impure. It also proves that many Egyptians did eat fish. It is also known that some ceremonies could be performed only by men who were ceremonially pure. To achieve that state one had to abstain from eating meat or fish for a specified period of time. It is known that many Egyptians worshipped the eel because that practice was a source of amusement to the Greeks. The following poem by a Greek author expresses this sentiment clearly:

"I never could myself your comrade be
For neither our manner nor our laws
Agree with yours, but they are wholly different.
You do adore an ox. I sacrifice him
To the great gods in Heaven. You do think
An eel the mightiest of divinities
But we do eat him as the best of fish."

(Alexandrides in Athenaeus)

The famous historian, Plutarch, describes the feuds between two Egyptian cities; one named after the fish Oxyrhynchus and the other

Cynopolis. To the former the fish whose name it bore was sacred and could not be eaten. When there was bad feeling between the two cities the Cynopolites would ceremonially eat the fish Oxyrhynchus, whereupon the Oxyrhynchites would retaliate by eating in public a dog, the sacred animal of Cynopolis. This was equivalent to our custom of burning in effigy those who offend us. The hostility between the cities would grow as a result and finally lead to open and bloody warfare.

In ancient Greece it would also seem that fish was not a very desirable food. Thus Homer sings of his heroes who would eat fish only when "hunger subdued their bellies."

"Weight for weight fish do not generally have as high caloric values as meat, because of the lower fat and the higher water content." In addition, fish is richer than meat in the protein, gelatin, which dissolves in water and is thus lost. Yet, the proteins of fish do resemble in every way the meat proteins in their nutritive value to the organism. After all, what we eat of the fish is the muscle of an animal that lives in water. It cannot differ very much from the meat of land animals.

Fish roe and fish liver are excellent sources of several important nutritive elements. As is well known, fish oils are rich in vitamin D, the sunshine vitamin, the lack of which causes rickets. This vitamin is also present in beef liver, milk, whole egg and butter but not in comparable quantities. Fish livers are also rich sources of vitamin A, the vitamin which prevents night blindness and eye deterioration. The mineral content of fish is similar to that of meat though the iron content is somewhat lower.

Since fish oils are our best and most concentrated sources of vitamin D, a word may be said here about this vitamin. Rickets is a disease which affects the formation of bones. Bony structures and teeth are composed almost entirely of calcium phosphate, for which both calcium and phosphorus are required. These minerals are supplied by the blood which gets them from the food and in which they must be present in certain amounts and proportions. Their mere presence is not enough, however, and for healthy bone and teeth

formation, the body requires either vitamin D, or sunshine which forms vitamin D in the outer layers of the skin. Our chief sources of this vitamin, besides sunshine, are fish-liver oils, egg yolks, and to a smaller extent milk.

Rickets, or softness of bones, usually manifests itself in children as curved legs which have been bent by the weight of the body, an enlarged head and swollen belly, and seems to have been known in England and on the continent as far back as the seventeenth century. It became widespread in England with the advance of industrialization. It was common in those days to feed children after weaning with a "slop made with flour and diluted cows' milk or whey." The famous seventeenth century English physician, Glisson, wrote that he found more cases of rickets among the rich than among the poor. This was probably due to the fact that the poor continued to use milk after weaning while the rich followed the prevailing medical theory that milk was not healthful except in infancy and old age. Rickets was then classified by doctors as a "cold distemper" and they recommended the avoidance of "cold and moist" foods including fish which would have cured it. Yet, even then some physicians knew that the liver of birds was a good cure for it. Again we see how error and truth mingle until science and research separate the seed from the chaff.

Where whole-wheat bread, milk and butter were parts of the diet, a small amount of vitamin D was sufficient for healthy bones. When the prices of butter and milk made them inaccessible to the poor, the incidence of rickets rose. With bad times the disease became seriously aggravated and physicians anxiously sought a remedy. As usual, all kinds of causes were postulated, such as "impure air and bad diet," excess acid coming from milk and flour, and inheritance or "venereal taint" of the parents.

But, during the eighteenth century cod-liver oil came into use in England. Fish-liver oils had been used in Europe for illumination and for dressing leather. In Iceland, however, fish-liver oil was eaten like blubber and regarded as wholesome food. In Europe these oils were also used for rubbing ailing joints and limbs in rheumatism

and, in the course of time, the oil came to be taken by mouth. In 1782, two English physicians finally proved the curative value of fish-liver oil in rickets when taken by mouth by an experimental test at a hospital in Manchester.

Originally the oil was putrid and nauseating. With time it was prepared in purer form as the practice of prescribing such oils for rickets became more popular. The oils were used for young lions and bear cubs in the London Zoological Garden and were found effective in raising them to maturity; a feat that could not previously be accomplished. It was only in recent years that the chemical compounds responsible for vitamin D action were isolated and studied. It was also found that sunshine could convert an inactive chemical into an active one, which is the vitamin.

A rich source of minerals is found in shellfish, a food group forbidden in the Bible and regarded as undesirable by many peoples, mostly land dwellers. But it may also be tabooed by groups living along a coast such as the Eskimos, who, at best, do not possess too large a selection of food and can least afford to reject shellfish. Many are the people in our own society who, though exposed to shellfish, develop a repugnance to it which is never really overcome. Yet, oysters are an important American food and two-thirds of the world's oyster supply is produced in this country.

The proteins of shellfish possess, of course, the same valuable properties as the meats of fish and land animals. But its main value lies in its wealth of iron, copper and iodine. It also has the vitamins A, B, and C. The latter vitamin makes shellfish, especially oysters when eaten raw, very valuable for coast dwellers who may not have a good supply of fresh fruit and vegetables. Raw fish livers are also good sources, but then raw oysters taste so much better to our palate.

The presence of iodine in fish is most valuable. Just as iron is part of the molecule of the red substance of the blood which transports oxygen to our cells, so is iodine part of the compound produced by the gland located in the neck and known as the thyroid. This substance is called a hormone because it is produced by a duct-

less gland which sends its secretions into the blood stream to be carried to many parts of the body upon which it acts.

For normal growth and development the body requires specified amounts of this hormone. Not only does a deficiency create havoc but, unlike the case of vitamins, excess of the stuff is also harmful, though in a different way. Thus, an overgrown thyroid gland gives rise to a dangerous type of goiter, leading to bulging eyes, nervousness and loss of weight. Thyroids which function below par produce too little of the hormone, leading in children to subnormal development such as cretinism, and in adults to general physical and mental sluggishness and serious disability.

Lack of iodine in the diet produces an enlarged thyroid and goiter. This constitutes a serious menace in countries which obtain their water from lakes that have insufficient iodine. Switzerland and for a while the regions around the Great Lakes suffered widely from goiter until it was discovered that addition of traces of iodine to the diet removed the disease. The iodine is added either to the water or to salt, hence the name, iodized salt. Both these items necessarily reach every person in a community. A sound diet must not only have a sufficient amount of the known vitamins but also those minerals which the body needs for proper functioning.

Meat and fish invarably form a desirable item of any diet because of their important psychological value. Where they are accepted components of a diet, their absence is likely to lead to a feeling of disaffection with the meal, unless there is a good reason for it, such as wartime rationing.

Chapter X

Vegetables, Roots, Legumes and Nuts

We have spoken so far of vegetables and fruits only as sources of vitamin C. Yet these products present quite a variety of nutritive combinations more valuable than merely this one vitamin of which, true enough, they happen to be the sole source in our diet. Actually, vegetables, roots, legumes and nuts constitute for us a most significant source of vitamin A, the B complex, the less known vitamins, most of the minerals, carbohydrates, fats and proteins. This in itself proves that a vegetarian diet can have all the components of a sound diet. It also proves that considering all fruits and vegetables on an equal footing, by lumping them loosely into one group, is not enough.

Since earliest times primitive man availed himself readily of many vegetables, roots and nuts although variety was never a strong objective with him. On the contrary, after becoming accustomed to a given kind of vegetable, he will cling to it stubbornly and reject new ones. As in every other human activity, however, time and circumstances worked wonders and novelty gradually burrowed its way into, and merged with, the old.

Although it is true that modern man has not added any domesticated animals to those known in antiquity and not very many new vegetables, it is also a fact that even the most advanced primitive cultures possessed only a few edible vegetables. On the other hand, a country like Greece, judging by the writings of Pliny, had hundreds of cultivated herbs used mostly for medicinal purposes. But then all new vegetables and foods such as sugar, tea or coffee were originally used as medicines. Similarly, many of the herbs cultivated by Greek physicians as medicines were subsequently eaten and came to be regarded as indispensable foods.

We know that Egypt and Palestine already knew the cereals, rye, millet, barley and wheat. In fact, the cereals are probably the oldest

plants cultivated by man. The legumes, peas, beans, and lentils, as well as cucumbers were also known to the ancient world, to Jews and Egyptians. Esau, the hunter who did not live in tents as his brother Jacob did, sold his birthright, whatever that implied, for lentil soup. In Biblical times the only other vegetables widely used were onions, garlic, cabbage, gourds and melons. Most of the old world fruits have been known since earliest antiquity. Olive oil was expertly extracted and the Phoenicians traded it for silver with Spain which apparently didn't grow the olive tree then as it does today. It was an article of export for Judea as well.

The date, almond and lemon are ancient trees held in high esteem. Jacob sent nuts and almonds, besides honey, spices and myrrh, "the best fruit of the land," to Egypt to befriend Joseph from whom he wanted to buy corn when "the famine was sore in the land." Jacob had been familiar with hazel and chestnut trees while raising cattle as a young man, since it is cited in the Bible that he cut rings in their branches to produce spotting in the cattle. Spotted animals were to belong to him according to his agreement with his master who was to become his father-in-law. Plum, pear, cherry, apple, quince and St. John's bread trees were grown and grafted in ancient times. St. John's bread yielded a precious oil while the residue after the extraction made good animal fodder. "I builded me houses; I planted me vineyards: I made me gardens and orchards and I planted trees in them of all kind of fruits," says Ecclesiastes. However, when the details of the gardens are revealed, as in the Song of Solomon, we find in them "camphire with spikenard, and saffron; calamus and cinnamon with all trees of frankincense, myrrh and aloes with all the chief spices." The Bible's summary of the food of prosperity is grain and wine and oil, to which should be added fruit, nuts and spices. But vegetables are seldom encountered. The food eaten by the Hebrews in Egypt and dreamed of by them in the desert, consisted of flesh, fish "eaten freely," cucumbers, melons, leeks, onions and garlic.

The staple food of the common people of Egypt was bread and oil. The few meats and vegetables which they did eat were appar-

ently eaten on rare occasions only. Yet it is of interest that among the several thousand Egyptian skeletons carefully studied to date, there were very few that showed signs of detectable deficiency diseases such as rickets or scurvy. Dental caries were also far less common than today. Such studies do, however, indicate that "we may rest assured prehistoric (and ancient) man had his quota—and more —of broken bones, aching joints and skeletal abnormalities."

In Greece we encounter lettuce, several kinds of radishes, turnips, beets and celery. To these the Romans added the artichoke, the carrot, asparagus, the sugar beet, parsnip, endive, some wild berries, mustard, fennel, and a few more such plants. Obviously, the vegetables known to primitive man were always ample enough to supply him with their peculiar contribution of vitamin C, minerals and some of the other vitamins which can, however, be readily obtained elsewhere. Though definite evidence is not available, it seems that man always added some vegetables and fruits to his diet though he may not have partaken of them sufficiently for the maximum of health. But the fact that man survived at all is strong evidence that his diet permitted life to exist. A true and sustained deficiency would ultimately have led to his extinction as a species.

We do know, however, that the average span of life of primitive man was less than half of its present level and that he was afflicted with many diseases that must have been dietary in nature, as is attested by the frequent references to particular eye and skin ailments in ancient records. Nor should we forget that populations were small and life was difficult without the modicum of relief which we now obtain from drugs, medicines, hygiene, surgery, sanitation and the like. And just as an individual can endure much more than he imagines, so can a community or tribe live on for centuries in suffering and misery and yet survive. We must bear in mind that man's struggle on earth shows these contradictory features of ingenuity and inventiveness on the one hand, functioning side by side with slavery to habit and resistance to novelty; generosity and kindness in some respects going hand-in-hand with cruelty and hate in others.

The same lack of apparent harmony is seen in man's food habits.

While man invariably finds satisfactory foods, he does not always use them wisely. For that science and its application are needed. He always has a rich selection of foods but will choose one or two as favorites, make them staples and resort to others only occasionally, thus inviting harm to his health. Moreover, of many good vegetables available to him, he may select spices and onions and garlic that have sharp enough tastes but little nutritive value.

On the other hand, what is commonly called superstitious belief has proved a great help in the expansion of his diet. Many herbs came to be used because someone's fantasy imagined they were good for one disease or another. The reasons for the origins of such beliefs often were wholly erroneous and based upon such factors as external resemblance or even a similarity in name or a numerological relationship. Yet, more and more plants came to be used because eating them was considered proper medication.

Man's unenthusiastic attitude to vegetables persisted almost until modern times. Few vegetables were eaten in the middle ages and even those few reluctantly. Man's food was considered to be meat, fish, cider and other drinks, bread and cheese. The meats were mixed with onions and garlic, domestic spicy herbs and the classical foreign spices. But vegetable salads and fruits were never regarded as substantial and legitimate parts of the meal. And they still are not so considered by many of us today. The following quotation from a work written in the thirteenth century gives us an idea of the kind of vegetables people raised in their gardens in those days and how they were valued. Roger, canon of Varadin at the time of the Tartar invasion, managed to escape its wave of slaughter by hiding until the invaders withdrew because their emperor had died in far-off Asia. He writes, "Strengthening ourselves by our trust in God, we went out to the edge of the wood and climbed a high tree. We saw that the open countryside, untouched by the Tartars on their arrival, was now utterly desolate. We started out across this barren land, where the bell towers of the churches guided us, and we were happy if we found any onions or garlic in the gardens of the ruined villages. Otherwise, we had to subsist on roots."

Vegetables did not come into daily use in Europe until the eighteenth century. Cabbage, carrots, turnips and sprouts and, of course, potatoes made their appearance then. As far back as the second half of the seventeenth century, we already encounter some authors who advocate more generous consumption of vegetables. "With the additions of legumes, roots, and vegetables, five pounds of weight of meat will go as far as we generally make ten or fifteen and the consumer will be more free of the scurvy and not less fit for the laborious offices of life." Institutional diets during that century consisted of bread, meat, cheese, broth and pudding. The drink was beer. There probably would be a cow on the grounds for some milk for the sick, a pig to consume the leftovers and "a little garden for herbs, onions." More vegetables appear on the records toward the end of the eighteenth century. "Potatoes or parsnips mashed with milk. Boiled beef and greens, broth with herbs and roots. Milk Porridge. Gruel. Mutton and greens." Even in the nineteenth century bread and meat were still considered the most wholesome meal. Writes William Cobbett in 1823, "The gardens are neat and full of vegetables of the best kinds. I see very few of 'Ireland's lazy root' (potatoes). . . . A young man . . . came running to me with his victuals in his hand; and I was glad to see that his food consisted of a good lump of household bread and not a very small piece of bacon."

Most of the common vegetables of our present diet which have not yet been mentioned are the ones presented to us by the discovery of America. With the discovery of that completely isolated continent, there fell into our laps, figuratively speaking, the white or Irish potato, the yam and sweet potato, corn, the peanut and a host of other nuts, the tomato, squash, many varieties of beans, cocoa, tobacco, numerous berries, the pineapple, and many other plant foods.

The reception given to some of these foods is of interest and illustrates that man resists new foods, whether they are the meat or milk of new animals or merely new vegetables. The spread of the white potato is an interesting illustration. The Spanish conquerors of Central and South America found the potato growing on the cool

plateaus of Peru, in the land of the Incas. The natives had developed numerous breeds of it and treated it as their staple food together with corn. The potatoes were dried in the sun, pounded into flour and used to make breadlike cakes. The first contemporary historian to write about Columbus was Peter Martyr, who, on September 13, 1493, wrote to the archbishop of Granada: "Columbus discovered an island (Hispaniola) whose inhabitants are nourished by a root. Balls the size of pears or small melons grow out of a small shrub. When these ripen, they are dug out as beets and radishes are with us; they are then dried in the sun, cut up, ground into flour and made into bread which is then boiled."

The potato plant reached Europe around 1584 when, according to some accounts, Sir Walter Raleigh presumably brought it to Ireland and planted it in his garden. It is certain that in 1596 potatoes were planted in London, brought there most likely from Spain. The potato had entered continental Europe via Spain early in the sixteenth century and spread from there to Italy and Burgundy around 1560. England had already been introduced to the sweet potato which had been imported from America earlier and was used as a delicacy and known as batate. The new tuber was erroneously called by the same name which later came to be potato. It too was treated as a rare delicacy. Yet it failed to gain popularity. In 1663 the London Royal Society advocated its cultivation to avoid hunger in case of crop failure. Though it is rare for an official body to be so farsighted, the public failed to respond. It was not until the end of the eighteenth century that the potato really began spreading in England.

Ireland took to it somewhat earlier but did it in earnest. The potato rapidly became a staple food in that country and was eaten commonly in the jacket with salt or herring. In fact, the majority of the population ate little else.

In Germany and on the continent of Europe the potato spread rather slowly. A strong prejudice existed against it among the farmers who believed that it poisoned the ground and helped spread the plague and caused diarrhea besides, all of which were merely rationalizations in defense of a prejudice. We have already seen how

Count Rumford cleverly taught the people of Bavaria to grow it and overcame all resistance. A similar and even more laborious educational campaign occurred in France.

Everywhere force of habit and the comfort found in what is established worked against the newcomer. The Slavs and Germans cherished their flour and legumes, the Italians their polenta and corn, the French their bread and vegetables, and all of them refused to be persuaded. They all knew the potato and referred to it as animal fodder, which sealed its doom so far as they were concerned. Yet, from the time of its earliest importation to Europe naturalists and science teachers praised its virtues and advocated its cultivation.

Early in the seventeenth century the potato was a rare and exclusively royal delicacy in France. Yet, in spite of such prestige, propaganda and glamor, the tuber failed to spread. And it was not until the years prior to the French Revolution that an army apothecary named Parmentier, who, while attached to the French military hospitals stationed in invaded regions of Germany, had observed the use of the potato in some locality, and later wished to see it gain favor in his homeland. The potato was not very popular in Germany either, though it had gained a foothold here and there. In the year 1749 an observer wrote that the potato was "considered (in Germany) the worst vegetable though the very poorest are obliged to eat it." In 1761 Turgot, the French political leader, sought to popularize it among his country's impoverished and starved peasantry. That there was need for a new food is evidenced by the fact that the French Academy offered a prize for any new item that could relieve starvation.

It was then that Parmentier began his campaign in earnest. Marie Antoinette and Louis XVI gave him land on which he planted potatoes. The king carried potato blossoms in his lapel and Marie Antoinette in her hair. The courtiers ate and praised the potato at court. Yet the peasantry stood aloof.

Parmentier sought to sell potatoes cheap and found no buyers. The following year he gathered in a big crop and offered it free of

charge to all farmers, but found no candidates. In view of the fact that a few landowners had planted it on their estates, he hit on a simple ruse. He ordered town criers in all villages to announce with much formality that the theft of potatoes in the field by those who were curious to try out this wonderful ground apple, as it is called in French, would be severely punished. There was much pillage and many peasants began raising potatoes.

It is of interest that practically every country and even every German duchy or kingdom had its potato apostle who proselytized and agitated for its spread. Country preachers who were more farsighted than the farmers and advocated its acceptance were popularly known as "potato preachers." But once the barrier of initial resistance was crossed, the tuber was recognized everywhere as a blessing. It may now well be regarded as the savior of the poor in Europe since it yields more food per acre than any other starch crop.

Even in India there was strong resistance to the potato. Its cultivation was introduced into Bengal by the English in the latter half of the eighteenth century. An Indian scholar writes, "For a long time its consumption was banned by orthodox Brahmans but now all who can afford potatoes, and like to eat them, do so without a scruple."

The sweet potato, properly called batate, spread more pleasantly and even faster than the white potato but remained a delicacy rather than a staple. On the other hand, corn had a rather interesting fate. It had been eaten by American Indians since their earliest days on this continent and was the daily bread of many tribes. It was the focal point of their worship and faith, their folklore and destiny. They prepared it in numerous ways, made meal and bread from it, learned to store it and made sugar or alcoholic liquor from it as well.

It was Columbus himself who brought large ears of corn to Spain. It resembled the well-known ancient African corn, was accepted very readily and spread rapidly. As early as the sixteenth century it was grown in Spain, Portugal, France and England.

Some form of corn was known in early times in Africa and the Orient, hence the name Turkish corn. The consensus of contempo-

rary authors seems to be, however, that the corn which Europe came to know was our Indian corn or maize. It was not brought to Europe by the Crusaders as some believed but by the discoverers of America. It is a fact, however, that it was during the sixteenth and seventeenth centuries that corn spread widely in Spain, then Italy, Greece, and the Balkans, and reached Germany through Hungary. In some parts of Europe it did not take root until the nineteenth century. Much of central, northern, eastern and western Europe still refuses to eat it. It is not eaten in England, France, most of Germany, the Scandinavian lands and Russia. In these countries it is looked upon as food for animals and not man. On the other hand, in Italy and Hungary it became such a favorite as even to supplant the potato.

In some parts of the Tyrol and Italy corn is mixed with wheat and rye to make a soup blend or bread and the well-known polenta. In Germany and France corn on the cob is pickled in vinegar and regarded as a delicacy. Its value as excellent fodder for cattle is highly appreciated everywhere.

It is of interest that as far back as the eighteenth century, it had already been observed that wherever corn became a staple and forced other cereals out of the diet, pellagra followed. The disease appeared in Spain where corn first became popular. It came next to France and then to Italy where it became endemic, which means permanently rooted.

Here then we see the idiosyncrasies of diffusion. The potato spread with difficulty, overcoming much resistance but finally winning complete and grateful acceptance, while corn spread rapidly, met little resistance yet finally failed to obtain universal acceptance. Moreover, where it was well received, the reception was so hearty that other useful cereals were abandoned and pellagra afflicted the population.

Just as nature endows people with specialized talents even when she wants to be at all generous, so does she give plant and animal tissues specialized endowments in nutritive sources and vitamin content. Corn is rich in starch, of course, but also, particularly in the

case of the yellow variety, in the substance which is converted into vitamin A by the liver. Vitamin A, as such, is found in animals only, in fish-liver oils already noted for their vitamin D content and in milk and eggs. We also obtain it from plants which have a mother substance of this vitamin, referred to as a precursor, located in all leafy green or yellow vegetables. This vitamin is essential to growth and development and is of especial importance to the condition of the eyes and their capacity for night vision, to general health and resistance to infection. The vitamin forms a part of the light-sensitive substance contained in the retina of our eyes and is intimately connected with its function. The vitamin is carried by the blood to the retina which is the light-sensitive part of the eyeball where it combines with a protein to form the compound necessary for vision. Light reacts with this substance so as to cause the chemical system thus put in motion to stimulate the optic nerve and produce the sensation we call seeing. Vitamin A is destroyed in the process, hence, a continuous supply of it is necessary. A diet deficient in vitamin A leads to poor night vision which is a serious handicap in night flying and blackouts. Sustained deficiencies lead to acute eye diseases and even blindness. As with other vitamin deficiencies the damage is not limited to the eyes but manifests itself in disturbances to other organs and tissues.

Kale, spinach, turnip greens, broccoli, carrots, sweet potatoes and peas rank high as sources of this vitamin. The more colored the leaf or vegetable, the higher the vitamin content. Thus, the green outside leaves of cabbage and lettuce are richer in it than the pale inner ones. Roots and tubers do not usually contain this vitamin but some, like the sweet potato or carrot, betray its presence by their color. Milk and eggs, our main animal sources of vitamin A, owe their vitamin content to the fact that the cow and hen feed upon grass and other green vegetables and store it in their respective products. It is a plant product not produced by any animal. The vitamin content of milk and eggs depends upon what the animals eat. Hence, the plant sources are most reliable.

Anyone familiar with ancient literature knows how frequently

eye doctors and eye diseases are encountered in its volumes. Thus, the Greek historian, Herodotus, was impressed by the large number of eye doctors in Egypt and considered it a sign of high medical development. It is also of interest that the great Greek physician, Hippocrates, the founder of all medical science, treated eye diseases with liver, which happens to be a rich source of vitamin A. It must not be concluded that he did it on the basis of carefully tested observations. It was a lucky stab in the dark; but such lucky strikes do occur every now and then.

White corn has practically no vitamin A while the yellow variety is rich in it. Both contain much starch, considerable vitamin B_1, some B_2 or riboflavin, an important component of the B complex, and a small percentage of protein not of very high biological value.

Medical science of the past had two conflicting theories about the relation between corn and pellagra. One claimed that corn possessed or produced a toxic substance and the other that pellagra was an infectious disease. From earliest days pellagra had, however, been suspected by some investigators of being dietary in origin, and the work of Dr. Goldberger gave it final proof.

It is not clear why a corn diet should result in pellagra. Corn has no niacin which is the vitamin that prevents the disease when it supplements a well-balanced diet. But then polished rice and white wheaten flour have no niacin either and yet populations which make these items their main food do not get the disease. It has been suggested that people subsisting on corn tend to eat less of other foods than those subsisting on the other cereals and that it is such specialization which is the cause of pellagra.

We are now in a position to see that what we lumped together in this discussion as vegetables should be properly classified into three groups. Our first group would consist of the green or yellow leafy vegetables already mentioned. Within the second group we may include potatoes and sweet potatoes and in the third, all leguminous plants, especially in the dried form. All this is apart from the vitamin C vegetables and fruits, namely, cabbage, tomatoes and citrus fruits. Each group makes a different contribution to our diet and if

a representative of each is consumed daily, the protection of our health through diet is assured.

The first group is important mainly for its vitamin A supply. Butter, eggs, milk or liver in the amounts we usually consume cannot alone yield enough of that precious vitamin. Our habits being what they are, enough of the vitamin can be gotten only from additional daily servings of leafy vegetables. Potatoes are well established in our dietary and no great hardship is imposed by eating some daily. We must, therefore, rely upon this source for part of our daily supply of thiamine, starch, minerals and even some vitamin C. Sweet potatoes may well be put together with the Irish, though they are richer in vitamin A. On the other hand, the legumes—beans, peas, peanuts and lentils—and to some degree also nuts, differ from both these groups and are essential because of their high protein value. Their wealth of minerals and vitamins must, of course, also be given due recognition, especially the vitamins of the B complex.

Our diet being what it is, we must depend for the completion of our protein, vitamin B and mineral requirements upon legumes and nuts. Within this group may also be included vegetables such as onions, cauliflower and broccoli, not embraced by other classifications, and dried fruits or any fresh fruits not otherwise cited. It is essential that these three groups be given due weight in our diet. They differ in composition though they are classed by our language as vegetables. Their contributions to our needs are different. Not all the vitamins are as yet known to us and many new ones will doubtless be discovered as time goes on.

Chapter XI

Fats and Oils

If the terms carbohydrate and protein are abstract chemical names to most people, surely fats and oils are not. They are as familiar to most people as starch or water and their general properties are fairly well known from common experience.

It is, therefore, little wonder that primitive man made early use of fats and vegetable oils in a number of ways. The most popular was olive oil, and it probably also is the most ancient. Noah's dove returned to the ark with an olive branch, thus indicating that olive trees were already cultivated then. The ancient Egyptians, Hebrews and Phoenicians traded with this oil in many lands and held it in high regard.

Fats and oils have from time immemorial been used primarily as food and medicine; but they were employed also as cleansing agents, as fuels, and as ointments for ritualistic purposes. When used as cosmetics they were mixed with perfumes, cleverly extracted from numerous plants. The olive tree was almost revered and its destruction was severely condemned and punished in the ancient world. Yet, other sources of oil were not neglected, such as poppies or the sesame plant.

The Bible speaks of offerings "of fine flour mingled with oil" or of "cakes of fine flour mingled with oil," and "wafers of unleavened bread anointed with oil." We may also cite the following: "Command the children of Israel that they bring unto thee pure olive oil beaten for the light to cause the lamps to burn continually." Pouring oil on altars or on appointed or elected leaders was a solemn and impressive ceremony whose purpose was to sanctify and purify.

We may cite as an example the practice employed by the warlike Masai who live by the sword and spear. The smiths who forge

their weapons are regarded by them as a most lowly and contemptuous caste whose contact is degrading and whom one may kill at will. All weapons made by these smiths must, therefore, be well anointed with oil before they may be used. For that matter even killing is prohibited to the Masai, though war is their major occupation. This seeming contradiction is also satisfactorily rationalized. They claim that the Bantus, whom they periodically attack and plunder, have appropriated for themselves cattle which God had explicitly and exclusively given to the Masai. Hence, they must resort to arms to enforce the will of God.

Special sacrifices were made of animal fat, as is frequently related in the Bible. After an animal was sacrificed, its fat was removed and burned separately. The ancient Hebrews and other tribes of the East believed the fat, especially that of the belly, to be the seat of the soul and forbade it as food. Special prejudices and myths were built around the fat of the kidney. As often happened, such beliefs led to its use as a unique and potent medicine for a variety of diseases. Similar notions prevailed among most primitive cultures. The Zulus still consider cattle fat the greatest luxury as food and also grease their bodies with it in great solemnity.

Australian primitives do not scalp their dead enemies but remove pieces of their fat to carry about with them. Fat is often rubbed on the bodies of boys and girls at their puberty ceremonies when the youngsters are formally initiated into the tribe. Like the Hebrews of old, the Australians too believed that fat harbored the soul and contained the powers and virtues of life. Hence, they believed as well that their gods rejoiced in "the smell of burning grease." In some cases mourners rub themselves with the fat of the deceased to show their loyalty and thus effect a physical union. Australian natives eat the fat of the dead to gain the strength which the dead no longer require. This is a common practice among cannibal tribes. In general, it may be emphasized that cannibalism was practiced more for the purpose of acquiring dead men's powers than for the sake of satisfying hunger.

Fantastic as these beliefs may seem today, they led nevertheless

to many valuable customs and discoveries. Primitive medicine was built upon the same kind of assumptions as primitive dietary and health ideas. What we now regard as ridiculous superstitions were viewed by these primitive people as plausible and even susceptible of proof. They believed that vegetable oils cleaned the body. Hence, they used it internally as well as externally and in this way they discovered many valuable oily purgatives, such as castor oil. In a similar fashion the belief that fat contained the soul and strength of men and animals made them rub their skins with it or eat it. It is because primitive man attached so much importance to fats and oils that these compounds played such an important role in his religious ceremonials and sacrifices.

It is interesting to note that lard and bear's fat were widely used as medicines in Europe until comparatively recently. Fats of other animals were used as well but they did not gain the same repute. On the other hand, butter was and still is being used for rubbing the body and hair. Some tribes will use it primarily as an ointment and only rarely or regretfully as a food. Often butter is used first as an ointment and subsequently as food.

The kind of fats used for cooking purposes are just as much subject to custom as the use of bread or rice as staple foods, a favorite meat or the milk of a particular animal. Our South uses fatback, Germany favors goose fat, or rather, did until Hitler confiscated all of it for ammunition in his holy war for racial supremacy, or to feed his elect henchmen. Chicken fat is highly regarded in Europe but is not used much in this country. The Balkan nations, the Orient and India use exclusively olive oil or some other vegetable fat for cooking purposes. In South America, as we have already seen, oil for cooking and fuel was obtained from eggs.

The peoples of India, like many other eastern peoples, show special aversion to all animal fats, except butter of course. The spark that initiated the bloody Sepoy rebellion of 1857 was ignited by the introduction of a new rifle requiring greased cartridges. It was necessary for soldiers to bite off the ends of the cartridges before loading this new gun. The Indian soldiers were sufficiently aroused over

the prospect of handling or tasting animal fat to risk a rebellion. It goes without saying that there were other contributory causes. Yet the Mohammedan's aversion to lard and the Hindu's repugnance for both lard and beef fat were sufficient to set off the spark.

Scientifically, one fat source is as good as another. Yet, different human groups will develop preferences, even as they do in the selection of their starch, milk or meat sources. Thus, the ancient Romans used vegetable oil for food and butter for cosmetics. Elsewhere the reverse custom prevailed. In Germany the preparation of goose fat used to be the occasion for a unique family celebration. The accumulated fat was rendered, the fat poured off and set aside for future use and the residue eaten in a festive mood. In other countries chicken fat is similarly prepared. The fat is used for cooking and as a spread until the following summer. Little vegetable oil is used in these countries except by the very poor.

We see then that the use of fat in the diet is extremely ancient. It is used for cooking, frying and baking and later as a spread on bread. It is drunk or eaten straight, just as the Eskimos eat blubber. It is highly thought of as food and medicine, as worthy of sacrifice, as fuel for lamps in temples or at home and as a base for perfumes or soap. Fat was later mixed with alkali from the soil or with plant ashes to make soap which is merely a combination of fatty acids and alkali elements.

Ingenious methods of extracting oil from seeds or nuts have also come down to us from antiquity. The oils are present in the seeds and are merely pressed out. What is left behind is often used as animal fodder. A vast variety of seeds were put to such uses and with our recent expansion of industrial efforts, the utilization of these oils has been enlarged. For many centuries oils from poppy seeds, linseed, sesame, rapeseed, cottonseed, soybean, corn, cocoanut, peanut and a host of others have been extracted and purified.

Fats and oils are high energy-yielding foods. Weight for weight they yield about twice as many calories when used as fuel by the body as do carbohydrates or protein. The fat molecule has more carbon than carbohydrates and is a most concentrated fuel.

Fat is used up in the body as readily as protein or carbohydrates. Special fat-splitting enzymes break up the fatty molecule into smaller components which are absorbed by the walls of the intestine. In the tissues the fat may be rebuilt from the molecular fragments. But plants and animals also store fats from excess carbohydrates or even protein not used up as fuel. Hence, stored fat is a reserve energy depot maintained by all living organisms.

A diet of some fat is as essential to life as are vitamins or minerals. Animals fed on a diet that contains no fat whatever develop a nutritional disease involving skin inflammation, degeneration of the kidneys and disturbance in sexual function. As soon as fats are added to the diet, these symptoms vanish and normal health is restored. It is not lack of fat or oil in general that causes the disturbance but only several specific constituents of the fat molecule. By the addition of these fractions, health is restored.

Not all fats or oils contain these curative fatty acids. Butterfat, though rich it vitamins, and tung oil, for example, do not have it, while olive oil, lard, corn oil, egg yolk fats, linseed and poppyseed oils possess large amounts. In addition, there are fat substances of animal origin which contain still another component that plays a vital role in health, in the function of the liver and in the proper utilization of carbohydrates. Recent experiments have shown that butter contains some as yet unidentified factors essential to growth and health.

Fat is a desirable food, but when taken too liberally it exerts a retarding influence on digestion. The movements of the stomach and its secretion of digestive juices are slowed. Hence, a fat-rich meal is truly "heavy" because the ingested material remains longer in the stomach than fat-free food. This is a virtue only insofar as it gives the meal "staying" qualities. A meal containing some fat leaves us with a greater feeling of satisfaction than one having very little or none of it. Also, butter used cold as a spread is more easily digested than when fried into potatoes or other foods. When combined with fat, the starches and proteins remain longer in the stomach and are digested slowly. Hence, an excess of fat in the diet is unde-

sirable. Besides, if there is relatively more fat than carbohydrate in the diet, a disturbance occurs in which the normal reaction of the body is made to yield an accumulation of harmful products detectable even in the urine. For this reason, the amount of fat consumed normally should be kept within limits.

By way of summary, we may say then that both plant and animal fats have importance in our diet. Animal fats contain the vitamins A and D which are fat soluble, but vegetable fats do not. All fats contain elements which are required for health and constitute a very good source of high energy value.

Not all food is to be judged from the vitamin viewpoint alone. True, the vitamin-rich items are our protective foods and must be given full consideration because we have no means of detecting direct vitamin shortage. But next to vitamins and minerals and the protein and fat elements needed for health, due attention must be paid to energy-yielding foods so that the body may be provided with enough fuel to give it strength for best performance and prevent deterioration. Fats, starches and sugars are valuable from this point of view.

It should also be borne in mind that we get much fat in the normal foods we eat, such as milk, vegetables, meats and fruit. Edible fats are widely distributed in nature. Since the concentrated, purified fats come from plants and their seeds or from animals, it stands to reason that some fat is invariably consumed with most of our plant and animal foods. Some fat should be taken daily in pure form either as butter or its substitutes, such as enriched margarine, not so much for their energy yield as for their contents of vitamin A. Fortunately butter, enriched margarine and vegetable oils are all desirable for cooking and we acquire them willy-nilly in our regular nourishment. Besides, our palates seem to have a desire for some fatty tastes.

It is worth stressing that where weight is to be regulated by the diet the problem is to balance the intake of food with the output of energy. The body works more or less like a chemical engine and there is a strict relation between fuel consumption, work units and heat

output. Deposition of fat occurs when more calories are consumed than are expended. The mere act of eating some fat does not result in immediate fat deposition. If the calories of all ingested food are all expended in the course of the day's work, then no fattening occurs. On the other hand, as was already indicated, fat can be formed by the body from a diet involving no fat whatever, since the organism can convert unused starch as well as excess protein into fat.

Fats and oils should be eaten in moderation, however. An ounce of fat yields almost twice as many calories as an ounce of starch or protein and it is easy to consume more of it than the body normally can use. To illustrate, three-quarters of a pound of fat will supply enough energy for a day's work. To obtain the same number of calories from rice, one would have to eat eight pounds of it. For growing boys and girls and for men engaged in strenuous physical exercise, fat is almost essential if they are to get enough total calories.

Fats and oils also play an important role in industry, which, of course, makes them so much more important in wartime than in peacetime. Fats and oils consist of fatty acids and glycerine. The latter is used in the production of explosives, for which reason we are asked to save all discarded kitchen fat. Many oils are used as lubricants and in the manufacture of paint, varnish, linoleum, and printer's ink. Some of these are edible and of good flavor, such as tung, soybean, coconut, palm and olive oils. Because many of these have hitherto been imported, it is now necessary to make substitutions and readjustments so that many edible fats and oils can be used in industry. Fortunately, this country is in no danger of any serious fat shortage because of our adequate supply of butter and of peanut, soybean and flaxseed oils as well as other domestic preparations. There is no fear that we will ever be in the position of Germany in the last war. Shortage of fat in the diet of the German people proved to be a major contributing factor in the breakdown of civilian morale. It brought in its trail inadequate energy and fat-soluble vitamin deficiencies.

Chapter XII

Sugar

After a heavy starch or carbohydrate diet, the amount of sugar in the blood increases for a while and then returns to normal. The body is provided with juices which split the large starch and carbohydrate molecules into sugar. The sugar is then removed from the blood and is stored in the liver and muscles.

The body possesses a gland situated near the stomach called in laboratory language the pancreas, but known in the meat shop as sweetbreads. This gland secretes a substance that causes the removal of sugar from the blood and its storage in the liver and muscles. This substance is called insulin. When failure of proper function of the pancreas occurs, sugar accumulates in the blood. Since its high concentration in the blood persists, it forces its way through the kidney into the urine where it is readily detected. This condition is known as diabetes and constitutes a serious disturbance in the body's scheme of normal energy utilization.

All starches and carbohydrates are converted by the body into blood sugar and stored in the liver and muscles to be used again when needed for work or energy. At all times blood contains a certain basic amount of sugar which stays constant within narrow limits, varying somewhat with the output of energy.

Although it might almost be said that we swim in sugar, most human palates are very fond of the sweet taste. This fondness is entirely a matter of psychology. Our tasting sweet results from the action of sugar upon the tongue, and the subsequent relay of the nerve impulse to the brain. The sensation occurring there we call sweet and it is apparently pleasurable.

The human craving for sugar is universal, in children as well as

adults. Contemporary primitives to whom refined sugar is a novelty are so greedy for it that they will lick it up when spilled on the ground, regardless of the dirt they consume in recovering a few precious grains.

While knowledge of sweets and fondness for them were common to all cultures of antiquity and to most primitive societies, sugar is a relatively new product to us. Primitive man satisfied his sweet tooth, however, by a variety of good sugar concentrates, the most famous of which is honey.

References to honey are frequent in all ancient literature. To dwell in a "land of milk and honey" was the dream of the Hebrew tribes. Yet, highly regarded though it was and desirable as a delicacy, it seems to have been scarce everywhere. It was used to pay tithes, taxes and tribute. Strict property rights guarded all bees' nests or even the trees on the branches of which they were located. Theft of honey was punished with death which made it a crime on a par with murder and witchcraft. Often all the honey of the land belonged to the king and its consumption was prohibited to all other people.

As was only to be expected, honey or honey mixed with milk was sacrificed to the souls of the dead, interred with them or, like oil, poured on altars and generously offered to the gods. Homer tells us how Achilles poured honey and oil on the bier at the funeral-pyre of Patroclus. Odysseus, too, when he sought the advice of a seer in Hades, "poured a libation for all the dead, first mixed milk and honey, then sweet wine, and thirdly water."

In spite of primitive man's love for sweets and his craving for honey, he seems to have used it seldom as a direct food but mainly as a preservative of meat and in the making of the intoxicant, mead. It also gained the reputation of a potent medicine. This quality together with its role in sacrificial offerings gave it alleged powers over spirits and sorcerers.

To satisfy his desire for sweets primitive man looked for other sources as well, though never with the same energy or anxiety that he displayed in his quest for narcotics and intoxicants. He frequently sacrificed his sugar for fermentation to obtain alcoholic beverages.

It should be borne in mind that most fruits have some sugar in them. The desire for sugar could have been satisfied by concentrating the sugar contents of that source.

The American Indians collected the juices of the sugar maple and boiled off the excess water to form maple syrup. They also prepared corn syrup as a source of sugar. The saps of the sweet birch, banana, pear, plum and many other fruits easily yielded gratifying sugar concentrates. But by and large neither primitive man nor the societies of antiquity catered too elaborately to their sweet tooth. It is likely that the available preparations were not sweet enough or that all sugar-yielding material was reserved for alcoholic drink. It is a fact that the true enjoyment of and hunger for sugar begins with the importation of crystallized sugar from the juices of the sugar cane, and its later preparation from beets.

Concentrated sugar from cane or bamboo was an early achievement of man and seems to have originated in India. The prophet Jeremiah speaks of "sweet cane from a far country." Nearchus, an admiral in the navy of Alexander the Great who sailed his ships down the Indus river in 325 B.C., mentions "honey-bearing reeds," presumably cane. Specific reference to crystalline sugar is found in the works of the Greek medical writer Dioscorides who lived in the days of Nero. He says, "There is a sort of hard honey which is called saccharum (sugar) found upon canes in India. It is grainy like salt and brittle between the teeth, but of sweet taste withal." A similar reference is found in the writings of Seneca, who states: "There is found among the Indians a honey contained in the reed." And Pliny states, "Arabia produces sugar but that of India is more renowned." In the seventh century of our era Tai-tsung, the Emperor of China, sent ambassadors to India to learn the art of extracting syrup from the sugar cane and of boiling down the liquid into a soft paste. We know that this process yields a dark product equivalent to our low-grade brown sugar.

Sugar has apparently been available in the East since earliest antiquity and the Arabs and Moors brought the cane with them from the Nile Valley to Sicily and Spain in which lands its cultiva-

tion proved possible. In the fifteenth century the king of Portugal transplanted it to the Canary Islands where it prospered. With the discovery of the New World, cane sugar came to Brazil, San Domingo, Mexico, Louisiana, Cuba and elsewhere. Here it found a second home more favorable to its cultivation than the original one, and sugar became a most important item of manufacture and trade in the New World.

Methods of refining were also making some progress, though slowly. Refined sugar first appeared in Egypt in the eighth century of our era after which time there was a lull of about seven hundred years. During the fifteenth century sugar loaves were produced in Venice and the price was, of course, very high. It was only after sugar cane had been transplanted to America, Africa, Asia, and the Pacific Islands that the price fell somewhat. Its present level came within sight only after the German chemist, Margraf, demonstrated that sugar could also be extracted and crystallized from beets. This root soon reached wide cultivation in Europe and proved as good a source as cane. Napoleon issued an edict which forced France to develop its beet-sugar industry because his war with Britain deprived him of imported sugar. Today sugar-beet and cane crops all over the world are in the ratio of two to one.

The maple sugar trade developed in this country because of the Quakers. True to their conscience, they would have none of cane sugar because it was everywhere produced by slave labor. The sap of the maple tree offered a good substitute though the concentration of sugar in it is only about one-eighth of what it is in cane or beet extracts. By boiling down the liquid, however, the juice is readily concentrated to a syrup from which the sugar can be crystallized. Today this source is exploited only for syrup. A syrupy sugar extract is also obtained from sorghum.

In ancient days sugar seems not to have been used much as a food. Primarily, it was a medicine, like herbs and other generally rare but highly esteemed products. Man has a tendency to seize upon the new, the glamorous, and the exotic and to look upon it, ofttimes, as a cure for all his ills. Just so did ancient and medieval medicine

employ rare stones and herbs, the fat or even excreta of rare animals such as crocodiles, gallstones or fish bones—in short, anything novel, unique or intriguing. Little wonder then that such a rare, sweet and expensive commodity as sugar, particularly when imported from a far country, should promptly be invested with great curative powers.

Not many taboos seem to have arisen in regard to sugar. Refined sugar was not eaten much in India because the methods of refining involved filtering the boiled-down sugar extract through bone charcoal, which process removes the impurities. This goes against Brahman belief so that the sugar was considered polluted. Modern refining methods have done away with that step and the consumption of sugar is increasing in that country.

In the middle ages sugar was bought and sold only in apothecary shops. There was a popular old proverb, "Like an apothecary without sugar," which incidentally is still in use in Spain.

Sugar was bought in minute quantities and prescribed by physicians for many ailments. Less than two hundred years ago, it still cost $2.75 a pound. It appeared only on the tables of the wealthy and even when served in small amounts it reflected credit on the hostess on whose table it appeared.

The Crusaders found it more abundant in the East and they were duly impressed with the wealth and luxury that this abundance betokened. Their tales of Oriental wealth and ease appealed to the popular imagination and helped to increase the demand for the product and its glamor. Venice controlled most of the trade and its invention of the sugar loaf strengthened its monopoly.

During the fifteenth century, Portugal and to some extent Spain gained ascendancy in this trade. Cane was grown on the Iberian peninsula and the Canary Islands, and Spanish and Portuguese ships plied the seas with sugar and spices. The trade was profitable and booming and as a result rivalries ensued. In the wars which resulted Portugal and Spain were defeated and Antwerp and London became the centers for sugar refining and sugar export. From 1624 to 1654 the Dutch controlled Brazil and most of the sugar trade. Maritime supremacy and control of the trade then passed under British control

with France, Holland and Portugal making constant efforts to regain some share of it.

Unlike the other three powers, Britain was not interested in developing colonial sugar plantations but limited itself to trade. Sugar loomed large then in the famous four cornered commercial traffic between the American colonies, the West Indies, Africa and Europe. The West Indies exported sugar and molasses to the American continent and to Europe. New England, too, made its own rum from West Indian sugar. These products went to Africa there to be exchanged for slaves in order to produce more sugar and rum. Besides slaves these products were exchanged for manufactures from Europe and for lumber, fruit, tobacco and livestock from the American continent.

Then came the forceful movement in Britain for the abolition of the slave trade which finally resulted in prohibitory legislation. Sugar production suffered in the British possessions, since without cheap slave labor, British growers could not compete with those who retained it. The center of the sugar trade was then transferred to Cuba and Puerto Rico. Cane sugar began losing ground steadily thereafter because clever methods for refining sugar from beets were developed in Germany and France, and Europe concentrated on beet sugar production.

"Sugar and spice and all things nice" were the craze of the world for hundreds of years. Wars were waged over the sugar trade and especially for the control of the spice trade, as we shall see in greater detail in the next chapter. In those days an abundance of spices and sugar was an indication of great luxury. But this belief was short lived. Yet, well may we ponder the transient values of human goals and fads. That which today is considered the height of pleasure, the shortcut to happiness, tomorrow may well be the prosaic or even the ludicrous. In the case of sugar, scientists may even arise to tell us that we consume too much of it, that it is not essential to health and welfare, even harmful to teeth and, to the dismay of some, that it is fattening.

It is claimed by some that in our enthusiasm for protective foods

containing vitamins and minerals, we may often forget our energy requirements. It is true that sugar is direct and immediate fuel. The action of digestive juices upon it is fast and it gets rapidly into the blood stream which carries it to all cells of the body. For this reason, it can overcome fatigue and exhaustion almost instantaneously, and strengthen the weakened body, though, as we shall see, at some disadvantage. It is also true that the growing and active young and those performing hard work may need energy-yielding foods if their normal diet fails to yield an ample supply.

It is also true that there is the psychological element to be considered as well. There are few among us who do not crave some sugar, especially within our society where a liking for sweets in a variety of forms has already been established. Unfortunately the habits dictated by custom are not always the best; sometimes they are definitely not in full harmony with the laws of nature and man. Many are the people today who, like the Chinese or Japanese, take no sugar in their tea or in their coffee. Many even reduce its use in other food items, which, incidentally, is not true of the Japanese. To those accustomed to sugar in some form, its deprivation may be as annoying as a lack of tobacco to a smoker. We know that inmates of prison and concentration camps crave it strongly, and the supply of candy to our armed forces is considered by the commissary as essential.

It should be noted that some people show a greater craving for sugar than others. Allowing for the fact that habit has much to do with it, it can still be readily demonstrated that the desire for sweets varies with the individual. Self-control is, however, desirable, and often imperative, for self-indulgence by the individual has never improved human society.

The truth of the matter is that the vast consumption of sugar in this country, somewhere around 125 pounds per person annually, has become a national health menace. Sugar should not even take the place of starch in our diet as a source of energy because no source of starch in nature is pure starch. On the contrary, nature always presents us with starches mixed with some protein and many minerals

and vitamins; witness the unrefined cereals or potatoes. Hence, getting our energy supply from these sources is healthful and desirable. Obtaining it in the form of refined sugar is harmful because we are then prevented from consuming other foods that have important protective contributions to make to our health.

The second point to bear in mind about sugar is its antagonistic action on the intake and requirements of vitamin B_1. It has long been known that people who live on a polished rice diet will not develop very acute symptoms of beriberi if fed considerable amounts of fat in addition. In general, the more carbohydrate and sugar the body receives, the more thiamine it requires. This may be explained by the fact that thiamine is part of an enzyme involved in the breakdown of carbohydrates. Enzymes are usually used up in the course of physiological reactions. Hence the more carbohydrate is being burned by the body, the more thiamine is being destroyed and the more of it the body requires for the maintenance of health. Since the population of this country does not get enough thiamine even under normal conditions, it stands to reason that as the sugar consumption in wartime increases the menace of thiamine deficiency grows even larger. On this account, too, our effort should be to decrease sugar consumption as rapidly as we can induce the public to do so.

It is folly to recommend a heavy sugar meal for workers on the pretense that sugar readily overcomes fatigue. Such a course is fallacious, and the truth of the matter is that even a straight starch meal should be discouraged. For heavy workers a mixed diet is more desirable. By a mixed diet is meant a meal consisting of carbohydrates as well as proteins and fats. The reason for this recommendation is the fact that starch and sugar lead, as stated previously, to a rapid increase of blood sugar. Incidentally, both of these forms of carbohydrates are converted to blood sugar at approximately the same rate, thus contradicting the general notion that sugar is a more ready fuel than starch.

But the point to consider is that after any heavy carbohydrate meal, the accumulated sugar in the blood tends to drop rather rap-

idly, leading to a blood sugar shortage fairly quickly. A mixed diet has greater staying power, which means that digestion occurs slowly, blood sugar also accumulates slowly, and does not disappear as rapidly as it does after a pure carbohydrate diet. Hence fatigue due to rapid sugar removal does not set in as rapidly as it does shortly after a sugar diet.

The widespread demand for sugar has also led to intensive sugar cane production on the part of agriculture in many regions or even in whole countries. At best this specialization in cash crops is rarely beneficial to small growers. Usually for the sake of the cash they neglect their own nutrition, and the general economy leads to servitude and poverty for the small farmer. A subsidence of the public clamor for sugar will thus help states or regions that specialize in raising sugar cane rather than impoverish them. The needed economic adjustments may require some form of financial aid, but it is bound to be a nationally profitable investment. Much of the labor and machinery used in the production and purification of sugar and sugar products could readily be used for more urgent tasks on the food production front. Both psychologically and economically we are in a better position to make a break now while we are at war than under normal peace-time conditions.

People who cater much to their sweet tooth resemble in every way children who clamor for candy. In children as well as in grown-ups, this is usually done at the expense of other good foods and consequently at the expense of health. It should also be remembered the sugar is costly precisely because it is so harmfully purified and thus depletes the pocketbook while taking the edge off the appetite.

This does not mean that science demands something akin to prohibition. Sugar is a luxury, a whim food, and should be treated as such. In wartime it should be treated as a luxury and for reasons of economy its production should be restricted before limitations are imposed on better foods.

There is a school of thought which advocates that precisely because sugar is a food of psychological and emotional value, it should not be limited. An abundance of it, the argument runs, aids

morale by keeping people satisfied, whereas depriving them of it will inflict suffering. Such logic differs in no way from the reasoning indulged in by some mothers who argue that because the child is sickly or weak, it should not be annoyed by being deprived of candy.

It is precisely because of the war and the fact that shortages are imminent that restriction of sugar both at home and in industry is necessary. If sugar is easily obtainable, the public will be tempted to replace missing items of good food with sweets. Besides, why not take advantage of the war psychology of sacrifice to abolish a bad food habit and spare needed labor, material and money for better purposes?

Chapter XIII

Condiments and Spices — An Episode in Human Folly

There can be little doubt that the mere act of eating afforded primitive man unique pleasure. Moreover, rarely was food an object to be bought in primitive society. Rather was it something to be shared by the entire group like hunting grounds, the hunt itself or tribal glory. And yet generally speaking little thought was ever given to intelligent provision for the future with an eye on planned security. On the contrary, primitive man behaved more or less as many animals do in the wild. When food was ample, he gorged himself till he vomited, thought nothing of it and began the feast all over again. When no food was available, he starved, ate grass or roots, and, these failing him, he suffered and died. When fortune favored, the old story was repeated. In every community one could find here and there traces of foresight but they were usually little developed.

Weddings, funerals, religious ceremonials, births, tribal celebrations, initiation rites, expiation for sins, in fact all conspicuous social or religious events, were all occasions for gluttony and drunkenness and "a menace to economic well-being." Those who provided great feasts were singled out for respect and envy.

But apparently food alone did not satisfy completely man's palate. As far back as records extend, we find man searching eagerly for condiments, stimulants and narcotics, most of which have no biological function but for which man can develop a powerful craving. Condiments are the substances which add relish to the food. They include salt, pickles, sauces and spices, as well as onions and garlic. Among the condiments may also be listed honey and sugar already discussed. With the exception of most of the spices, all items enumerated have some food value. On the other hand, the irritants

and intoxicants have no biological value whatever. They include coffee, tea, tobacco and alcoholic drinks and a host of drugs such as peyote, opium, coca, hashish, and the like, which are habit-forming, harmful to the personality and toxic.

Salt was man's earliest condiment, and the hunger for it is almost universal. Many primitive peoples obtained a salt mixture from ashes and would dip their meat into it before eating. Many North American Indian tribes were unfamiliar with our salt and resorted to alkaline potash instead. Even the famous Homer refers to nations that are not familiar with salt, which substance he dubs "divine." But as in the case of sugar, no sooner is our commercial salt introduced anywhere than it is immediately and enthusiastically received. It is craved as eagerly as sugar and is the medium of exchange in some part of the world even to this day. Some natives, such as pygmies, can eat whatever amount is offered them and still ask for more. Not unlike ourselves in the matter of luxuries, "a Dyak once having eaten salt can never do without it," or as another observer says of the primitive Veddahs, "it becomes for them a new need."

The exalted position given to salt in ancient society is of interest. It became the symbol of hospitality and friendship. "The Roman saltcellar was a symbol of family-life. Sprinkling with salt was a form of purification; it was also medicinal as in the Old Testament, and holy from its use in embalming." Because of its holiness and use in embalming, it became connected in people's minds with the mysterious practices of witches and sorcerers.

So highly valued was salt that it was used as money, hence the word salarium or salary. The ancients prepared it from sea water, and the very term salt is derived from the Greek word for sea. Because it is so widely used, it is a commodity that invites taxation, and the tax on salt in India has been for some time the bone of contention between the nationalists and the government.

Famous, of course, are the salt licks to which herds of animals make regular pilgrimages to satisfy their salt needs. These are herbivorous animals. Meat-eating animals, just as men do on a meat diet, never develop a similar salt hunger because they get enough of it in

their food. A vegetable diet seems to leave both men and animals salt-hungry.

Chemically, salt consists of sodium and chlorine, both important minerals in the functioning of the body. Yet, both these elements happen to be so widely distributed in our natural foods that there seldom is, under normal conditions, any need for the crystalline table salt we know. On the other hand large amounts of salt may be harmful. The more salt we have in our tissues, the more water do these retain for balance, often an undesirable condition. Large amounts of salt may stimulate the digestive system and interfere with food absorption. Hence, children and invalids should not use much salt. However, a good supply of salt is desirable in hot weather. Profuse sweating deprives the body of much salt. Since this is followed by the intake of considerable amounts of water, more salt must be supplied to prevent fainting spells or shock. Hence, the salt pills at drinking fountains in our factories. Recently it has been found that vitamin C pills may also have to be added to the drinking water of those who sweat profusely, because that vitamin too is lost in perspiration.

While on the subject of drinking, a word may be said about water, which is indispensable for life though it is not broken down by the body. Water is merely used as a solvent or carrying medium for everything else. It is also the medium in which every reaction takes place. It constitutes more than a third of our body weight, and dehydration or loss of water may have serious consequences. It is of interest that some animals, such as the camel, can get water from the breakdown of food substances.

Whether the animal lives in the sea, on land or in the air, its physiological processes take place in a water medium. Water carries the food and ejects the waste products. It functions in regulating the body and brings chemicals together for reactions, it aids digestion and absorption, prevents bacterial growth in the intestines, and in fact, makes life possible. Hence, drinking water daily is an important food rule.

Primitive man, like his modern brother, wanted more from his food than the satisfaction of hunger. He wanted badly a taste to

please his palate. His dietary was limited and recipes were few and stereotyped. Generally speaking, his food was monotonous, even though like ourselves he liked best the food he was accustomed to. No doubt he wanted it spiced and flavored, and from earliest days man looked for sharp-tasting additions to his staples.

Spices may also have been used as preservatives, although that was never a major consideration since primitive man did not do much preserving. Besides, as in the case of pemmican and sun-dried corn, when he did preserve he resorted to numerous other methods.

Among the oldest of spicy herbs were garlic, leeks, and onions. These were common in the diet of ancient Egypt and much loved by the populace, as is recorded by the great Greek historian Herodotus as well as in the Bible. In Greece and Rome they were consumed especially by the lower classes and exhaling the odor of garlic was considered vulgar. Yet, onions and especially garlic were thought to possess great medicinal value, a property attributed to all herbs. To the primitive this meant that they were just as valuable when applied externally as when taken internally. Since it was believed that diseases were caused by witches and evil eyes, garlic and onion as true medicines were believed to be strongly effective against them. The great healer Hippocrates and the scientist Dioscorides placed garlic high among their cures. Their authority gave it a great medicinal reputation throughout the middle ages.

Today garlic is as much subject to national custom as any other food item. Some nations use much of it, others very little. Many Americans ignorantly associate garlic with the French and Italians, even as the Mohammedan contemptuously refers to us as pork-eaters. By such sneers each seeks to establish his own superiority. The term beef-eaters has a similar emotional connotation to the Hindus. On the other hand in Nazi Germany garlic is associated with Jews. Buttons with a picture of the garlic plant or its name are worn by many Hitlerites to prove their ardent hatred of the people garlic is meant to symbolize. The mere mention of garlic by a Nazi orator causes the crowd to howl with fury and hatred.

The most outstanding spices of the past were cinnamon, pepper,

ginger, cloves and nutmeg, all of which have been known to man and highly valued since oldest times. It is known that they came originally from India, China, and remote isles. They were brought to the ancient lands by the Phoenicians and Egyptians and traded far and wide later by the Chinese and Arabs. They enjoyed a glamor and romance that man seldom bestowed upon other material things, reserving such honors usually for symbols created by his imagination or for hopes inspired by his sense of values.

Nations and empires rose and perished but the spice trade continued. The fall of Sidon or Babylon or Alexander's conquest of Persia, the destruction of Athens or the Barbarian invasions, the rise of Mohammedanism or the sweep of the crusades—none of these succeeded in interfering with it seriously for more than a few years. No sooner was the disturbance over than the caravan routes again teemed with life and business returned to normalcy. True, new routes often appeared and new short cuts. The center of trade did shift from one city to another but the trade kept swelling and expanding.

During and after the crusades, we find that for the European continent the focal trading point was Venice. Via Mecca, spices came to Egypt and thence by ship to Venice. Through Afghanistan, Persia, the Caspian Sea, and Constantinople another route also converged upon the Mediterranean Sea dominated by Venetian ships. From Venice the spice trade spread into all European lands and ports. Prices were high, profits increased and the wealth of Venice grew enormously.

It should be remembered that spices included those substances that added flavor to food but also those that were used as incense in temples and homes, as cosmetics, and above all for medicinal purposes. So highly were spices regarded that every religion thought it fitting to fill its temples with their odors and prescribed their being burnt before the gods. Even the Hebrews used it, and modern orthodox Jews are still obliged to smell once a week of a mixture of spices in a consecrated container. Women considered the odor of spices as indispensable to their charms as they do powder and lipstick today.

That spices should be used in medicine is quite understandable.

Until only two hundred years ago it was believed that all diseases came from poisonous vapors which entered the humors of the body. Hence, miasmas of swamps were feared, bad odors and breezes including night air were shunned as the causes of plagues. It is for this reason that opening windows at night was regarded as suicidal. Conversely, it was believed that pleasing aromas such as those of spices, cleansed and purified the air and imparted health and vigor.

Herbs in general were considered the key to all cures. The so-called doctrine of signatures, maintained by our own science of medicine until relatively recent years, proclaimed that each plant carried the signature or sign of the disease God intended it to cure. All plants, it was believed, were created with that in view and the careful observer who could learn to read those signatures would soon know the remedy for all ills. Progress in medicine simply meant learning to read correctly those divine or natural designations until all diseases were ultimately mastered.

All herbs were considered curative, but the spices gained first place among them by virtue of their mystery, odor, remote origin and glamor. Hence, their high price, desirability and prestige.

Most ancient of the spices was cinnamon, which is the sun-dried bark of a tree, gently removed and cleaned. The true cinnamon derives from Ceylon but there is also a Chinese variety known as cassia which dates back to about 2700 B.C. The Ceylonese variety was more highly valued although it is difficult to distinguish between it and the Chinese cassia.

Because spices in general were so highly regarded, they gained fantastic glamor. The learned Herodotus writes as follows: "The Arabs gather cinnamon more wonderfully (than cassia) though where it grows and which land brings it forth they are not capable of telling. They merely say it grows where Bacchus was raised, and immense birds gather the sticks we term cinnamon, so named by the Phoenicians; and the birds bring them to their nests built with dirt upon rocks no man can reach. But wisely the Arabs delude the birds. They cut up large slices of beef, donkey and other meat of large animals and place them near the nests and go into hiding. The birds

descend then upon the meat, which they seek to carry aloft to their nests. But it is too heavy and falls to the ground. In the meantime the Arabs hie to the nests and gather the cinnamon sticks which they sell in foreign lands." We find this story credulously repeated in the middle ages, indicating that once a product acquires glamor, it does not lose it very easily.

For thousands of years the civilized powers of Europe traded with the Indies, but so indirectly that the sources of the spices remained unknown. Moreover, the conquest of those lands was not sought. However, with the sudden development of maritime trade and naval powers in modern Europe, merchants and captains sailed all the oceans in search of the mysterious and fabulous Indies and the islands of the Orient.

Among these European powers Portugal was foremost. In quest of the spice trade her ships roamed the seven seas under such daring men as Bartholomeo Diaz and Vasco da Gama. Portuguese ships reached Ceylon, Sumatra, Malaya, Java, India, Persia, Abyssinia, and even China and Japan. Their merchants established trading posts everywhere and gained control of the entire spice trade so that the star of Venice declined and her commercial supremacy vanished.

Portugal grew rich and powerful and Lisbon became the commercial capital of Europe. But its glory did not last long. An ambitious and rising competitor was young Holland which also began sending its ships to all corners of the earth. Spain, too, cast eyes of envy upon her rich neighbor and her king, by right of blood relationship, inherited the throne of Portugal in 1580. But that expansion availed little. Holland, at first a vassal of Spain, stripped the combined empire of its Asiatic and Pacific posts and finally gained complete control of the lucrative spice trade.

It could not maintain all of its markets in the face of another rising power, England, which forced her out of Ceylon, India, Malaya and other outposts, yet leaving Holland considerable possessions and trade. London in turn became the commercial capital of Europe, but Britain generally treated her defeated rivals with a fairness uncommon in those days. It was Britain who opened the trade

to all nations, which perhaps aided in weakening the mystery and appeal of the spices and made their cultivation elsewhere possible. One thing is certain, however. After the bloodshed had ceased and prices came within reach of the average man something unexpected happened. People lost interest in spices, and their prices as well as consumption dropped steadily. The decline of their glory soon reached a record low and prices became so cheap that even transportation could not be paid for. Apparently, different times brought other attractions and different desires—and spices no longer lured the people's fancy.

It was held for many years that cinnamon could only be obtained from trees which grew wild in the jungles of Ceylon and that cultivated ones could not yield the spice. Hence, Ceylon remained for many years the sole source of this spice. Numerous were the dangers that confronted the merchants in cinnamon and its gatherers. They were maltreated by the natives who cut off the ears and noses of many or generally mutilated all captives. Malaria and wild elephant herds lurked everywhere, as well as fatal leeches which happened to abound on the island. Yet the quest went on in spite of these dangers.

But around 1770 the Dutch governor of Ceylon discovered a method of cultivating the tree in nurseries. His superiors in Batavia objected but somehow lost out and under strict government supervision cinnamon orchards sprang up over the island. The Dutch had a strict monopoly of the trade. Export of trees or of branches was prohibited under penalty of having both hands chopped off. All trees belonged to the government and the penalty for injuring one was death.

When Ceylon came under Britain, the monopoly was taken over by the British East India Company. In 1832 the British government dissolved that company and the spice trade became free. Whoever wished could buy the saplings and grow them. Much before that date, the English traders permitted its growth in Sumatra, Java and many other lands. Thus the monopoly was broken and prices declined.

Almost as ancient and as highly valued as cinnamon was pepper.

Both its black and white varieties were mentioned by Greek scientists centuries before Christ and its trade existed from earliest times. Even the barbarian Alaric, king of the Goths, who in the year 409 A.D. threatened Rome, demanded tribute of 3,000 pounds of pepper among other precious items. The spice was quite popular in Rome, especially the variety known as long pepper. Pliny, the author of the famous Natural History, expressed surprise at the great demand for pepper prevailing in his days because he did not share the taste for it. The desire for it was widespread, however. But it was during the middle ages that its fame soared to great heights. It became the queen of the spices and so highly prized universally that it could function as money anywhere. Not only tribute but fines were often exacted in pepper. As usual, fanciful stories of its origin, of its magic and medicinal powers were circulated and given credence by the ignorant and learned alike.

Pepper is, of course, an irritant and a stimulant. Ancient and medieval medicine was based on the principle that there were four qualities in nature—hot, cold, moist and dry and that the body had four humors—blood, yellow bile, phlegm and black bile. Each humor had two qualities. Blood, for example, was hot and moist and phlegm cold and moist. Disease was due to a disturbance of these properties as when blood became cold and moist instead of hot and moist. Hence, the proper cure should involve the addition of a heating agent to restore normalcy. The qualities of being hot or dry were also ascribed to the spices. Hence, it followed that they were medically potent. This explains the statement by a medieval historian, "Pepper is used in the kitchen and in apothecaries' shops, although in both places not as a meat or food, but for physic." The author then describes its value in curing indigestion, mistiness of the eyes and other complaints.

The price of pepper remained high throughout the centuries because of monopolistic control by the Arabs, Venetians, Portuguese or Dutch. It came down in price only after the British government dissolved the East India Company, the last spice monopoly.

Pepper is the berrylike seed of a climbing, trailing plant, borne

in a fruit on a catkin. The plant, which grew originally on the Malabar coast, requires a hot, humid climate and much shade. The method of drying determines whether black or white pepper is obtained. For the production of white pepper, the outer coating which gets dark on drying is removed. There was another variety known as long pepper which used to be the most expensive type in the middle ages and was considered best for culinary and medicinal purposes. During the last few centuries, its esteem waned and it is now "a forgotten spice."

So popular was pepper as a spice that its name was given to any new spice introduced. Thus, when the Spaniards visited Jamaica, they found a gnarled tree there that bore pungent and spicy berries, possessing in the dried state the flavor of cloves, cinnamon and nutmeg and therefore known as allspice. The Spaniards called it pimenta or pepper, hence, the name pimento. It should be recalled that Columbus, like all the other navigators of the time, looked for a sea route to the Indies to win the spice trade for Spain.

The disappointment of the Spaniards was assuaged by the gold and silver of the New World. But spices were still on their minds. And so whenever they found any spicy fruit, they named it pepper. It is in this manner that the Central and South American plants bearing pods of all sizes and shapes and eaten as vegetables came by their name of red and green peppers though the Aztec name "chili" also stuck to them. Some pods are hot, others sweet and mild. The pods may be dried and ground entire, seeds and all, yielding cayenne or capsicum or chili pepper. But if the pithy interior and the seeds are removed, the resultant powder is mild and is known as paprika. Some species of these capsicum or chili peppers are extremely hot, the hottest being the tiny bird or devil peppers.

Another famous spice is ginger which the ancients imported from Arabia and India. It too stemmed from Malabar and Bengal where it grew along the coast and seems to have been native to Southern China and Jamaica. The Spaniards transplanted it to Haiti where it flourishes. It is prepared from the roots of the small ginger plant which are washed, scraped and dried. It too was employed for

flavoring food as well as for the manufacture of perfumes and medicaments.

It is characteristic of ancient and primitive thought that whenever a spice was held in high esteem for its aroma, flavor and medicinal powers, it was invariably endowed also with great aphrodisiac properties. All love potions consisted of mixtures of spices in various proportions, to which some filler and local herbs were added. One of the stories of the Thousand and One Nights refers to the employment of spices for such purposes. Throughout the middle ages spices were used in the most famous compounded medicines, as were also viper's flesh and crocodile dung which was held to be particularly curative and which commanded prices approaching 50,000 dollars the ounce. Ginger was especially prized as a component of a medicine which was highly valued as a sure preventive of the plague.

Having prized spices as food flavoring, perfumes, aphrodisiacs, love potions, and medicines, it was only natural that the human imagination should go one step further and believe that they could also prolong life and cure or prevent all ills. This pattern of thought was characteristic of the middle ages and was wholly consistent with the ideas of health, disease, remedies and death prevailing at the time. If diseases came from putrid odors, then obviously the noble aromas of spices could overcome them. Since old age came from the accumulation of putrid humors and vapors in the body, then such aromatic spices as ginger could annihilate them. The same reasoning applied to other physiological phenomena as well. In harmony with these notions, it was common in the past to employ spices for flavoring wine and cordials which were held to be most wholesome and remedial.

Like many other spices ginger is pungent besides being aromatic. The pungency is due to a substance which, when consumed, acts physiologically to produce a dilation of the superficial blood vessels. This causes a warmth followed by perspiration which brings about cooling as a consequence. This characteristic stimulation is shown by mustard and pepper as well.

Closely related to ginger and equally popular was the spice turmeric. Because of its bright yellow color, it was also used as a dye for a variety of foodstuffs. With ginger it forms an essential ingredient of curry powder.

Cloves and nutmeg are two famed spices that were worth more than their weight in gold. Cloves are native to the Molucca Islands and are the dried flowers of an evergreen of the myrtle family. It was first used by the Chinese, centuries before Christ. It is perhaps because of its taste or glamor, or because it was employed to sweeten the breath that the Chinese law required all those who addressed the emperor to hold a clove in their mouths.

In the sixteenth century the Portuguese discovered the Moluccas but were expelled in the seventeenth by the Dutch who had decided to raise cloves only on Amboina Island for the sake of their monopoly. They destroyed all the trees on the Molucca Islands, arousing the anger of the natives who were in the habit of planting a tree at the birth of each child. Much bloodshed resulted but the spice trade went profitably on. The Dutch monopoly was subsequently broken by the French who planted clove trees on Mauritius Island. The spice was later grown as well in some possessions of the British Empire. Like other spices, cloves were used as love philters, aphrodisiacs, cosmetics, rejuvenating lotions, to say nothing of cures and preventives for innumerable diseases.

A few words may be said about nutmeg and mace. These are relatively recent spices, known in Europe only since the twelfth century when their first recorded use was for the fumigation of the streets of Rome during the coronation of an emperor. The two spices are products of the same plant, the nutmeg tree. Nutmeg refers to the fruit and mace to the material surrounding the nut.

Nutmeg and mace came from the Spice Islands and the Portuguese early gained control of their source, the island of Banda. The Portuguese were later driven out by the Dutch who held the monopoly for many years by employing their usual methods of ruthlessness. To maintain their monopolistic control the Dutch destroyed all trees that happened to grow on any other island. Nature was not

with them, however, and fruit pigeons frustrated their efforts. Feeding on the fruit, the birds swallowed the seeds which they excreted undamaged on other islands, thus spreading the tree.

Numerous other spices were on the market and their very names sounded romantic and intriguing. Coriander, cumin, calamus, orris, cardamon, aniseed, angelica, dill, fennel, fenugreek, grains of Paradise, marzipan, saffron, zedoary, and many others were names to charm and conjure with, though they leave us cold today. There was the famous "Vinegar of the Four Thieves," compounded of cloves, cinnamon, garlic, camphor and other aromatics. Four famous thieves who plundered homes of the dead in a plague-stricken French city used this mixture to ward off infection. They were finally apprehended and brought to justice. The Court marveled how they escaped contracting the disease and they were offered full pardon for revealing the secret of their amazing medicine which subsequently became very popular.

All spices yield aromatic oils upon distillation. It is to these oils that the aromas of the spices are due. It was believed in the past that they constituted the essence of the spice and for this reason they are still known as essential oils. They are volatile, which accounts for the fact that on exposure to air for long periods, spices, especially after being ground, suffer loss of aroma and flavor. There are, however, some spices which contain non-volatile elements rich in the spicy taste. The isolated essential oils are not nutrient or edible. They are so extremely concentrated that they cannot be used in the kitchen, except in dilute form as "essence" consisting of dilute alcohol solutions, water suspensions or extracts.

The fame of these spices is now a thing of the past. Today, all we can say is—behold, how the mighty have fallen! The fate and status of food items are like the glory and powers of nations. Babylon, Persia, Judea, Greece, Egypt, Arabia, Rome, India and China were all names to conjure with. They were proud and mighty, and justly so. They had learning and talent, they had culture and organization. They had their golden ages which are like a flash of lightning on the screen of history. Yet seldom does glory pay a sec-

ond visit. It departs for other spheres to bestow its charms as if at random upon some nation here or there. And the once proud Persian becomes a laborer held in contempt as an ignoramus; the great builders of temples and empires in India become lowly colonials; the cultured people of the Empire of the Sun become laundrymen denied citizenship; and the descendants of Moses, Solomon, Christ and St. Paul become subjects of prejudice and discrimination even in the best of the democracies.

Apparently man is also subject to the caprices of chance or perhaps hidden design in nature. Biology tells us that plants or animals which flourish at one period may become extinct in another. Plants and animals which prosper in one environment may be doomed with the onset of even a not very radical change. Once change exists and nature is in flux, the fickleness of fate is only to be expected.

Yet, though the pride of nations may vanish and their prestige give way to contempt, their contributions frequently live on. Our present culture is a mosaic of the valuable contributions made by numerous races and nations. And our feeling of superiority to the Chinese or Italians or Indians or Jews does not affect our use of and respect for their contributions.

But such is not the fate of the spices. Once their prestige and glamor had vanished, nothing but a vacuum remained. Only a smile of wonder or sheer ridicule now greets the mention of garlic, nutmeg, myrrh, calamus or cloves. The fact is that spices no longer charm us, that they no longer are symbols of luxury, that even pepper is being dispensed with by many. Surely, their allure as medicaments, aphrodisiacs, restorers of youth and the like, is a thing of the past. Porcelain or china jars marked with the names of spices which newly weds used to receive as wedding gifts, stand empty now, or are filled with anything but the inscribed objects.

Well may we ponder the meaning of this change of taste. It is a fact that mankind everywhere wants its food flavored and often likes its flavors sharp. But this desire is subject to habit as well as to fashion, both of which are aspects of our belief pattern. The question arises, must such habits and fads be imposed upon us by ran-

dom forces or can we use our knowledge and control to render them scientifically desirable and socially less troublesome than the spices proved to be?

Once the spice fad gripped Europe, it spread like wildfire and lured both rich and poor, especially the latter. Those who sought to stop it were considered old fogies and reactionaries, evil-minded men who wanted luxuries to be enjoyed by the rich only, or if not that, then they were, to say the least, blind enemies of progress. "In the past," writes a German medical commentator, "our people were served well by a nutrient barley soup. But now happiness seems to issue for most people from spicy food, and if their fingers do not drip with saffron, and they fail to belch with cinnamon or if their breath lacks the aroma of cloves, they are miserable and do not think they live in decency and comfort. Although our Fatherland yields us varied and ample requirements for comfort, they yearn nevertheless in abject self-pity for the imported. Clothes, food, spices, they haul from the Pillar of Hercules, from Ceylon, the Ganges, the source of the Nile or places even beyond."

The opponents of the spice craze were mostly preachers and moralists who looked with suspicion upon, and ultimately condemned the reckless use of spices. Their motives were probably the same as those which have led many religious and even social leaders in our own times to oppose the spread of lipstick, boyish haircuts or smoking for women. Yet in the case of the opposition to spices there is little doubt that people would have gained in health and happiness had they heeded their warnings. Just as false reasoning has often been advanced for correct theories, it seems that irrelevant or false motives may occasionally lead to a desirable act.

To this day poor children in the slums of German cities will run after a well-dressed youngster passing through their territory and shout at him, "pepper licker, pepper licker," as an expression of contempt and envy. Licking pepper meant wealth, wallowing in luxury. Had there been radical cartoonists at the time, they might have pictured a capitalist "licking" pepper and nutmeg just as he is shown today with fat belly and jowls.

From the objectivity and remoteness of a different age, with different follies and different fads, we may well ask, was it worth it? The spice trade cost literally hundreds of thousands of human lives and centuries of war among the maritime nations of Europe. It led, in addition, to extensive enslavement of millions of natives. The inhumanity of the Dutch toward the natives in their efforts to monopolize the spice trade forms a sordid historical episode. The wars between Portugal and Holland, Holland and Spain, of both of these nations with England and France were prolonged and cruel.

The chiefs of conquered islands were made to compel their dependents to cultivate pepper in return for protection and a share of the profits. The entire native economy was disturbed and became specialized and dependent. The chiefs became more tyrannical and greedy. Loans were advanced to individuals on future crops, and in case of failure to deliver, whole villages became debtor-slaves. The slave trade and its evils flared up everywhere and profits were enormous. In time the American continents were discovered, as well as trade routes, in the quest for spices and trade, but those only augmented the growing record of human tragedy when we consider the fate of the American Indians. In addition piracy prospered on the high seas and it may truthfully be said that the craze for spices engendered more social evils than any other institution. The final outcome was that the poor of Europe spent the little they had on the spices they clamored for, instead of on whatever nutritional foods were available, and their health suffered accordingly. Moreover, the high prices of these luxuries led to much adulteration by European traders, which brought in its trail such consequences as flogging, heavy fines, and even the death penalty.

The present account is not presented for purposes of judgment and condemnation. Rather is it an attempt to study the past and observe objectively and scientifically the mode of human behavior in matters of food. With the facts at our disposal, we may well pose the question, what do they teach us?

The story of the rise and fall of the spice craze tells us that once a food habit becomes established, especially if it happens to be asso-

ciated with ideas of luxury and prestige, it is almost impossible to change it by appeals to common sense. Often, it has to run its course and exhaust itself. Moreover, once people become accustomed to sharp spices, plain food may become dull to them. For this reason the formation of habits should not be left to chance or fashion but to science. We all know today that we can enjoy our food just as well by having proper variety, homegrown and cheap sauces, and that ingenuity in recipes and research can supply us with adequate flavoring which need not be costly in terms of money, health and the lives of innocent people in wars of conquest and colonization.

We must guard against going to extremes, however, by thinking only of calories or vitamins, because the human being is still the basic factor in the complex equation of food. We know that some people like spice and sharp flavor with their food. We also know that this trend is shown by many human societies at all times. Hence, we may conclude that there is something in human nature which desires it. It would, therefore, be futile to go against it entirely. Rather must we study the nature of this desire to discover whether we can suppress it, whether it is necessary to do so or how it can be catered to at little expense and with maximum advantage to the individual and society.

In many social spheres tastes, habits and values are truly relative and cannot be judged because we lack an absolute objective scale. But in matters of food, science does supply us with a fairly objective and concrete yardstick. Hence, we must use it but not neglect the intangible psychological demands which are as real to man as the need for vitamins and energy. On the other hand, these very tasks and desires may be profitably viewed in the critical light of long-range historical perspectives. Are we, who clamor for our automobiles and other gadgets, in the same position as the victims of the spice craze? Does our quest for money, luxury and comforts serve our true welfare?

Chapter XIV

Stimulants and Intoxicants — The Futility of Harsh Laws

Just as man sought sharp spices to make his food more palatable or to satisfy his strong desire for exotic tastes, so he found comfort in some mild narcotics or intoxicants. It would seem as if a restlessness hung over him which was greatly ameliorated by a smoke or a drink or anything which either stirred up his mind, soothed or dulled it, befogged it into some temporary release, or even filled it with elation.

It is almost a rule with primitive man that his utilization of such stimulants is often associated with religious ritual or with social, tribal or familial celebrations of great importance. And in his quest for stimulants, man has displayed his usual ingenuity and inventiveness. More often than not his discoveries were arrived at in a roundabout way through his most frequent paths to practice, namely, fancy, religion or medicine.

Strangely enough, most of these substances are not pleasing to the taste when first tried. The habit has to be formed contrary to the immediate response of the patient. It is only after long discomfort and after many efforts at enduring it that the habit is finally formed. Gratification is then obtained, but only at the price of having become a slave to a laboriously and often painfully developed habit. It cannot be denied, however, that a sense of exhilaration and nervous relaxation is obtained as a recompense for initial suffering.

The mild narcotics hardly require much habituation, perhaps because they are mild. Tea, coffee, and cocoa are familiar to all of us. Favored by many millions are also Paraguay tea or mate, cocoa and chicory. Over one hundred million people chew betel or something akin to it. Over three hundred million people eat and smoke hashish. Even opium with all its destructiveness and demoralization

is used by many millions. "Not a people is found which does not use some means of narcotic enjoyment," says the authoritative scholar of society, Professor Sumner.

In Australia the plant, pituri, containing a drug of that name, enjoys wide popularity. The leaves and twigs of a small bush are gathered, dried in the sun, then chopped and powdered. The brown material obtained is either lumped into a quid for chewing or rolled into a cigar for smoking. The chewing is done communally. The lump is passed from mouth to mouth and the last chewer sticks it behind the ear of the first one whence it is taken from time to time to make the rounds and be finally swallowed.

In the East, Near East, Africa and India the smoking of hemp has become widespread. Its grip on the population can best be seen from the following quotation, the author of which, E. Torday, traveled on a steamer plying Lake Victoria in Africa, loaded with hemp. "Hemp smoking is a widely spread and promiscuous practice. In the interests of their health, I intervened, purchased the whole supply and deposited it in the fire. The natives came to remonstrate and when I tried to explain how bad it was for their health to smoke it, they would not believe me; in fact, one man told me that hemp was food, strength and happiness for them and that without it life was not worth living." It is from hemp that the famous drink and smoke known as hashish is prepared, as well as the milder bhang. The plant and its narcotic action have been known for two thousand years. It is very popular among the Mohammedans of Northern Africa and Asia as well as Indians to whom the Koran prohibits alcoholic drink. It is particularly indulged in by the poorer classes. The drug leads to hallucinations and excitement.

In 1378 an Arab ruler destroyed all hemp and imprisoned hemp eaters. His dungeons were quickly filled and so he ordered that those guilty of the habit have all their teeth pulled. All this severity proved to no avail, however. In later years when Napoleon conquered Egypt, he too promptly issued orders prohibiting the drinking of hashish and the smoking of hemp seeds. There were even more recent prohibitions which also proved futile.

The chewing of the betel nut prevails in all of southern Asia, including India, South China, and most islands off the continent. "No product of the Far East is craved for with the same ardor as betel. The Siamese and Manilese would rather give up rice, the main support of their lives, than betel, which exercises a more imperative power on its habitues than does tobacco on smokers. To cease to chew betel is for a betel-chewer the same as dying. The greatest privations and sufferings of human life, insufficient or bad nourishment, hard work, rough weather, and illness lose their disagreeable character before the comforting action of betel." Its devotees include many races and religions. It is chewed at all times, on all occasions and by all classes. It is a very ancient custom, no doubt thousands of years old.

Betel consists of a mixed morsel of areca palm nuts, the betel leaves and lime. It is masticated for long hours and by some even retained during sleep. There is much salivation and the saliva is brownish red. In the course of time, the teeth become greatly discolored. Often teeth and gums are covered with a crust. Since much betel must be chewed to get that crust and only the rich can afford it, these crusty protuberances between the lips have become fashionable and dignified. On the whole, however, betel chewing seems no more harmful than the use of tobacco or alcohol, and possibly less so.

So ingenious was man in his search for plants yielding narcotics and stimulants that the number of such substances actually made use of runs into hundreds. It is worth noting that their use is generally associated with religious ceremonies or social celebrations.

For example, among Central American Indians the drug peyote, or peyotl, was commonly consumed. The first historian of Mexico who wrote immediately after its conquest by Cortez has the following to say about it. "The Chichimekas (Mexican) Indians know herbs and roots, their properties and their effects. They also know of peyotl. Those who eat peyotl take it instead of wine. They assemble somewhere in the prairie, dance and sing all day and all night. The next day they meet again and weep to excess. The plant peyotl is white,

grows in the northern parts, and produces in those who eat or drink it terrible or ludicrous visions. The inebriety lasts two to three days and then disappears. The Chichimekas eat considerable amounts of the plant. It gives them strength, incites them to battle, alleviates fear, and they feel neither hunger nor thirst. It is even said that they are protected from every kind of danger."

This statement brings out clearly the social and religious experiences involved in the partaking of the drug. This attitude pervades many such practices and points to a significant lesson regarding man's conduct. Any experience which in any way affected his state of mind or his sentiments, which stimulated him emotionally or spiritually was immediately incorporated into his religious practices. The stimulant became holy and also magical. As has already been pointed out, what we call the magic and superstition of primitive man was in reality his science. Science implies man's observation and study of nature to the best of his ability at any particular time. It also implies his theoretical speculations, hence, explanations of accumulated facts, also postulated to the best of his abilities. Primitive man could not help having definite notions about the nature and importance of drugs which could do so much to his mental being, to his sentiments and impressions. If these substances produced smoke, they were so much more mysterious and therefore obviously related to evil forces, intriguing shadows or vapors that filled the jungles, forests and valleys. These were elements related to the invisible world to which the common herd gave no study but merely feared. It was the wise and thoughtful, the medicine-man and shaman who thought about them and who tried to decipher their meanings and gain control over them.

In early days man's mode of thought did not lead him to draw a clear line of distinction between religion, science and medicine, any more than the common man today has a clear idea of the distinction between physics and chemistry or biological and physical chemistry. Ancient man observed nature and grappled with problems in terms of all those aspects which formed a coherent picture in his mind. Hence, as with spices and other luxuries, man believed that his drugs,

either chewed or smoked, were medicinally potent, desirable sacrifices to the gods, effective against evil spirits, aphrodisiacs and rejuvenators of youth, creators of moods conducive to good feeling and agents paving the road to a comforting escape world.

Two more of the popular narcotics, stimulants or excitants of humanity may be mentioned here—the coca leaves and the kola nut. The conquistador of Peru, Francisco Pizarro, found in 1533 that the entire Indian population chewed the leaves of the coca shrub, mixed with lime or vegetable ashes. The habit seems to have spread to most of South America. The drug in question is cocaine and the effect on the chewer is to give him delight and relieve him of fatigue and hunger. "An apathetic feeling of internal peace from which he cannot be awakened overcomes him for about an hour," says a medical authority. It is energizing and yields strength and endurance to the undernourished and exhausted bodies of the natives.

As early as 1550 the Spanish Council of Lima sought to prohibit the use of coca which it described as "a useless object liable to promote the practices and superstitions of the Indians." The Council saw clearly that the use of coca contributed, together with oppression and malnutrition, to a growing deterioration of the Indian population. The exploitation of the natives by the political rulers and owners of mines went on apace. Since native labor was paid with coca leaves, in 1569 the government prohibited compulsory labor and the administration of coca because "the plant is only idolatry and the work of the devil and appears to give strength only by a deception of the Evil One; it possesses no virtue but shortens the life of many Indians who at most escape into the forests with ruined health. They should therefore not be compelled to labor and their health and lives should be preserved." Needless to say, the coca habit was not stopped by decree.

Coca beans were another excitant found in Mexico by Cortez. They were used as money, as were spices and other drugs elsewhere. They yielded chocolate, the drink of Montezuma, who consumed fifty goblets of it daily, thick as honey. It spread to Europe rapidly and became known as the food of the gods. Its progress was more rapid

than that of tea or coffee. It is a mild stimulant, especially in the relatively small amounts that we consume.

The kola nut is craved in the Sudan, and to the north and south of it, and is known as Sudan coffee. People will commit many crimes to obtain it. It is used as currency in Central Africa. As with coca, hemp and all other such substances, its victims attribute to it divine origin. It too contains caffeine. It has become a social symbol and is presented on occasions of marriage proposals. The dowry oath is sworn on the kola nut, it is burned with the dead, and it plays a role in friendship, peace ceremonials and hostilities.

A universal favorite of man is alcohol, and its intoxicating action is known among savage as well as civilized societies. It has been enjoyed by some individuals and condemned by others or both enjoyed and condemned by the same people ever since man came to know it. Alcoholic drinks are almost as old as man. They have been procured in numerous ways, each human group obtaining it from its own chosen source. While primitives drank it mostly as fermented mixtures, modern man, equipped with science, invented distillation which can prepare it in a concentrated and more effective form.

But with alcoholic mixtures there also appeared abuses. These were usually taken note of and the people were invariably admonished by teachers, prophets, judges, priests or healers even as they were by the heroes, saints and prophets of the Bible. "Woe unto them that rise up early in the morning, that they may follow strong drink; that continue until night till wine inflame them!" On a Grecian tombstone, more than two thousand years old, we find the following poetic epitaph:

> Wanderer, hear the warning of Orthon of Syracuse.
> Never travel at night or in winter when drunk!
> For such, you see, was my unhappy destiny; not at home
> But here I lie, covered with alien soil.

These regretful post mortem comments, as well as other impassioned warnings occur everywhere and at all times because abuses were universal. Egypt had its wine and beer, both usually mixed

with spices. It also had much excessive drinking. Wall records show a servant offering drinks to guests saying, "Be of festive disposition." Another painting shows a lady saying, "Give me eighteen vessels of wine; you see, I love drunkenness." Condemnation of drunkenness is not found in the early periods but is common somewhat later. Inscriptions on tombs show that some people demanded that six kinds of wine and four kinds of beer be interred with them. Drunkenness was common in Greece and Rome. The Christians of those days also partook of the evil as St. Paul's words of rebuke indicate. The Rig-Veda, sacred to the Hindus, also records and condemns drunkenness attained by imbibing rice wine.

On the other hand the skeptical or cynical attitude toward the preachers and their sermons against excessive drinking is also as old as the preaching itself. The epitaph of Epigonus on a frog that had fallen into a wine barrel, "Woe unto those who commit the wise folly of drinking water," is typical of that point of view.

In addition, there abounded also outright approval and glorification. Thus, orthodox Jews are obliged to partake of wine on the Sabbath and pray "Blessed art thou, O Lord our God, king of the Universe, Who has created the fruit of the vine." St. Clement glorified wine because it improved the temper, cleared the judgment, brought harmony in our intercourse with strangers and servants and made us more benevolent toward friends. Socrates expressed himself as follows: "It seems to me, O friends, to be right to drink; for wine comforts the soul, soothes the sorrows of man like madragora, and arouses joy as oil the flame."

The barbarian invasions did not change man's attitude to alcohol any more than they changed human nature. The Germanic tribes drank as much when they were Christians as when pagans. Drinking was as customary in the middle ages as it is common today. Excessive drinkers were to be found among famous poets and artists, kings and emperors, popes and heroes.

As already stated, primitive and ancient man displayed great ingenuity in finding ways and means of obtaining alcoholic drinks. He knew how to obtain them from sources that had sugar such as

palm wine, honey wine or mead, pulque of the agave or cactus juice, kumiss, kefir or mazun, the milk wines and wines from a variety of fruits and roots. But he could also obtain his fiery liquors by bringing about fermentation of starches. Strong drinks have also been prepared from millet, sorghum, barley, from which the word beer is derived, rice, from which the Japanese sake is prepared, maize, cassava or manioc which, like rice and yucca, are chewed so as to let the salivary juices help fermentation. Finally, as if not fully pleased with these preparations, man learned to distill the alcohol out of the mixture and obtain as strong a concentration of the fiery liquid as nature would permit. Repeated distillations give a purer, hence stronger, product. Yet many of these distillates also contain some injurious substances such as fusel oil or aldehydes.

That alcoholism, especially in its acute form, and drug addiction in general, are a menace to the individual and society very few people question. But it should also be noted that there is as yet no clearcut evidence that alcohol is in any way harmful in moderate amounts. It is a fact, however, that it is the ways and means of effecting the elimination of the admittedly harmful habits that have given rise to much dispute. We have seen that ever since alcohol was known to man, it was stamped as an evil by some who evoked religion, morals, legislation, severe penalties, social ostracism, and lastly, the verdict of science to bolster their arguments. Other narcotics were similarly fought. Yet these efforts were no more successful than were the diatribes of the seventeenth century preachers against spices. The latter case should bring to mind, on the other hand, that sometimes a social evil or an undesirable practice may lose its appeal suddenly, or gradually, for unknown reasons. This may happen in spite of the fact that in the past powerful frontal attacks of all kinds had been helpless in achieving the same result. Often the weakening of the grip of a habit is due to some new attractions or fads, hence the availability of new outlets for whatever it was the old habits satisfied.

Of special interest is the fact that several religions such as Mohammedanism and Hinduism, both of which still are strong and dominant over their devotees, have prohibited alcoholic drinks en-

tirely, as have also Mormonism and Methodist Christianity. The spread of western civilization is aiding considerably, however, in popularizing the transgression of these prohibitions.

Force has also been employed. In ancient Rome women were not allowed to drink wine. Egnatius Mecenius, who killed his wife for drinking, was acquitted by Romulus. Pompilius Faunus had his wife scourged to death because she emptied a pot of wine. Western Locri had legal prohibition and punished drinking with death. The law of Rome did not permit young men to drink until they reached their thirtieth year. Restrictions and punishments have existed in many lands in ancient and recent times. For example, France under François I passed a law which imprisoned on a diet of bread and water anyone found drunk in public. The second offense called for the birch and whip, the third, public flogging, and the fourth, cutting off an ear and exile.

For this reason cautious thinking is required before we launch crusades or make even modest attempts at changing the evil ways of man. Recognizing evil and lunging at it with whatever happens to lie at hand does not always guarantee a successful solution. Above all, knowledge of all the aspects of the evil is required, knowledge of man and the motives that induce the evil action. Are these suppressible? Can they be diverted or replaced? In addition, much practical, everyday human sympathy is required which means that the crusaders themselves should soften the rigorousness of their beliefs, and temper the nobility of their remote goals and their presumed benefits in the light of contemporary human values. The words of the apostle, St. Paul, may well act as an ameliorating force. "Let not him that eateth despise him that eateth not; and let not him which eateth not judge him that eateth." If we claim that our judgment is soundly based on the science of medicine and society, let us make sure that it is based on a sound understanding of man as well.

Less biologically and socially harmful, if at all, are tobacco, tea and coffee, though they all contain drugs in minute quantities and act as mild excitants. Their acceptance by our society is of interest, especially since they have no nutritive value, and have survived initial

opposition on a variety of grounds, only to be encountered more recently with a vote of non-confidence by the science of nutrition. From the viewpoint of economics, these habits should never have been established, since they are expensive and valueless. But apparently when something pleases our taste, we do not think it economical to deprive ourselves of it though we may know of its lack of nutritive value.

Christopher Columbus approached the island of Cuba on November 2, 1492, and dispatched two Spaniards to investigate the territory. They returned on November 6 and reported meeting men and women who held burning charcoal in their hands to which they added odoriferous herbs. They described the burning pipes which they compared to muskets lighted at one end and sucked at the other with the emerging smoke swallowed or inhaled. They reported that this rendered the people somewhat somnolent and intoxicated but relieved them of fatigue.

A few years later Bishop de las Casas, historian and famous friend of the Indian, wrote: "I know of Spaniards who imitate this custom, and when I reprimanded the savage practice, they answered that it was not in their power to refrain from indulging in the habit. Although the Spaniards were extremely surprised by this peculiar custom, on experimenting with it themselves they soon obtained such pleasure that they began to imitate the savage example." The Bishop concludes, "I do not know what benefit they derive from it."

Tobacco was in use over most of America when that continent was discovered by Europeans. Yet it was unknown over a considerable area of South America including Peru, Paraguay, and Chile. As was the case with all other stimulants, its utilization was closely linked with religion, ritual, social custom, magic and medicine. There were some Indian tribes that did not smoke it but employed it in ritual exclusively. Well known is the role of the pipe in Indian councils of war and peace, and varied were the customs that surrounded the use of tobacco among the Indian nations.

The plant came to Europe via Portugal in the middle of the sixteenth century. The French ambassador at the Portuguese Court,

Jean Nicot, hence nicotine, sent some seeds to Queen Catherine de Medici of France and she became its patron. Tobacco was then used as snuff and regarded as a potent medicine against headaches and other ills. It caught the public fancy and spread very rapidly. In less than one hundred years it covered the whole world. The snuff box was then as essential a part of a man's paraphernalia as is the handkerchief today. Subsequently tobacco was snuffed or chewed or smoked or consumed as liquor by savage and civilized alike, by men and women and, in many places, by children as well.

As with other articles of intangible satisfaction of this kind, the spread of tobacco was rapid in spite of much opposition. Because the Spanish priests took so heartily to smoking and snuff and indulged in it even at mass, Pope Urban VIII, the one who imprisoned Galileo, excommunicated in 1624 those who smoked in Church. Ten years later the Greek Church declared that Noah was intoxicated by tobacco fumes and forbade the plant to its adherents. In 1600 tobacco was mixed with incense in English churches and four years later King James I, the author of *Demonology,* a book exhorting one and all to exterminate witches, published another work entitled *Misocapnus* (The Tobacco-Hater). He called smoking "a custom loathsome to the eye, hateful to the nose, harmful to the brain, dangerous to the lungs." He imposed heavy duties on tobacco, gathering a handsome revenue, which according to current economic theories should have made him rather approve of the habit. Needless to say, the royal attitude was of no avail even though Francis Bacon, the great philosopher of science, described James I as "nearly a miracle." The craze for "dry drunkenness," as the tobacco habit was called, spread like dust before the wind and there was no stopping it.

The city of Luneberg decreed the death penalty for smoking and Saxony, Saxe-Gotha and Berlin prohibited smoking in public in 1723 and stipulated severe punishment for breaches of the law. Transylvania, Hungary, Austria, Switzerland and Sweden passed laws against it. Turkey at first pierced the noses of smokers, passed pipes through them and paraded the victims through the streets in Nazi fashion. In 1620 the death penalty was decreed there for the crime. Torture

and death were also decreed and meted out to thousands in Persia, China and Russia. The Shah of Persia believed smoking to be a menace to fertility and burned merchants in public, or for a change poured hot lead down their throats. In Abyssinia the law demanded that offenders have their noses cut off and the executive branch was never backward. Special fines were imposed in numerous countries including many of our own States. France for a while permitted its sale only by apothecaries. But the tobacco habit continued to gain adherents in many lands and recently women and children have taken to it, though many countries to this date prohibit the sale of tobacco to juveniles. Cruel laws were rescinded by the sons or grandsons of their authors, when they learned to enjoy the weed themselves. Elsewhere the hostility to tobacco died a quiet death, though many restrictions such as laws against smoking by juveniles and women, still persist.

The consensus among scientists is that nicotine, the drug substance in tobacco, can be harmful, although the extent of its harm is subject to divergent views. But this aspect of the problem does not really concern us. What is relevant is the strangeness and complexity of the nature of man which makes him enjoy voluntary subjugation to a habit that can do him physical and financial harm and which enslaves him so that he will not, and often cannot, free himself from it. The smoking habit often exacts its tribute in the form of fires resulting from it. Yet neither law nor suasion has yet succeeded in effecting its decline. Unlike our craze for spices, the common desire for tobacco is still dominant. As with alcohol, brutal measures have not helped. Science and reason have not been outstanding successes as deterrents. Clearly more knowledge of man and his waywardness is desired. Armed with such knowledge, we may rightly hope to become masters of our fate.

The spread of coffee and tea is also interesting. Coffee was exploited originally as a medicine and as a generally wonderful plant. It was first used in Abyssinia where the coffee berries were roasted, pulverized, mixed with fat and eaten. Around the fifteenth century, it arrived in Arabia where the Mohammedan priesthood

declared it intoxicating, hence, contrary to the law of the Koran which prohibits strong drink. In the year 1511 the newly appointed governor of Mecca arrived from Egypt and to his surprise saw dervishes drink coffee, which substance he had never seen before. He called a conference of theologians to decide whether the drink was to be considered intoxicating. The discussion lasted a long time. One of the participants who stated that coffee was similar in its action to wine and should be prohibited, was promptly seized and flogged because he had betrayed his having tasted wine. The convention was not able to reach a decision and two physicians were called in. They declared coffee to be a harmful intoxicant unfit for a Mohammedan. Those who drank it were severely punished. But the prohibition was soon abolished and the use of coffee spread. After a while, however, there was a revival of opposition and a new prohibition law was passed, but that too was soon rescinded and coffee won the field. In fifty years it spread to the entire population.

The physician, Rauwolf of Augsburg, who visited Constantinople in 1551 wrote: "Among other things they possess a beverage which they highly value called chaube. It is as black as ink, and very useful in various diseases, especially those of the stomach. They usually take it in the morning in public without fear of being seen. They drink it from small earthen or porcelain cups, as hot as they can bear it. They frequently lift these vessels to their lips and take small sips, and then pass them around in the order in which they are sitting. They prepare the beverage from water and a fruit which the natives call bunnu. This somewhat resembles the laurel berry in size and color. This beverage is very much in use, and for this reason a large number of merchants may be seen in the bazaars selling the fruits or the beverage."

By 1550 coffee had conquered Persia and Syria. The first coffee houses in Constantinople were opposed because the Mohammedan priests discovered that coffee turned black on roasting and the prophet had declared that God never intended man to eat coal. The coffee shops were closed only to be reopened again. But a new campaign by the city government sprang up against coffee houses as seats of

sin and sedition and they were heavily taxed. Soon the use of coffee went unmolested and its extension to Europe began.

Early in the seventeenth century it reached Venice and later Rome. Toward the middle of the century it came to Marseilles and Paris at the price of $25 a pound. It reached England and Holland at about the same time and at the end of the century it covered all of continental Europe.

In Europe, too, coffee had its enemies. In some sections of Germany it was prohibited and informers were rewarded. Elsewhere the punishments were caning or whipping. In 1777 the Prince-Bishop Wilhelm of Paderborn declared that the drinking of coffee was a privilege of the aristocracy, the clergy, and high officials. It was strictly forbidden to the middle classes and the peasants. King Frederick II of Prussia imposed a heavy tax on it because he wanted people to drink beer which he declared was health-giving. In Italy the famous naturalist Redi opposed coffee because he wished people to drink wine rather than a liquid "black as night in color." Symbolic of the trend is the fact that both Frederick II and Redi developed in time a love for the black drink and retracted their condemnations.

With coffee came the institution of coffee houses where merchants met to play games, smoke and talk. They became centers for intellectual discourse as well and places for the exchange of new ideas. Charles II of England wished to suppress them as "seminaries of sedition" but the people would not stand for it and he abandoned the effort. In Paris the cafés became the meeting ground of the encyclopedists and revolutionaries. Their later roles in the new literary and artistic movements are well known. The custom reached the New World also, and Boston in revolutionary days had many coffee shops frequented by prominent people of the time.

Tea, known in China since about the fifth century of our era, did not become known to the rest of the world until the end of the sixteenth century. Its medicinal virtues were extolled. The first London advertisement of it read, "The excellent Chinese beverage, recommended by all doctors." A Berlin physician declared, "A cup of tea is a medium for ensuing health and long life."

Current medicine is of the opinion that neither coffee nor tea is harmful in the quantities normally consumed. This must be regarded as a piece of good luck, since even if they were harmful, mankind would in all likelihood cling to them just the same.

Interesting as these incidents are in themselves, they have a definite bearing on the nature of man. The conclusion seems justified that apparently the majority of people everywhere have a certain desire for mild excitants or mild narcotics of some kind. Historical evidence will also justify the statement that legal or moral prohibitions against the use of such narcotics do not seem to be very effective. Once they catch the public fancy, neither severe punishment nor vilification by respected lay or religious authorities can stem the tide. Least effective of all seems to be the argument that the new fad is injurious to health. Once a narcotic practice becomes habitual, the argument of its causing bad health is about as effective in inhibiting its spread as is the argument of avowed pessimists that since all life leads to death, the sooner people put an end to their lives, the better. People listen to both arguments, shrug their shoulders and go about their business.

In the field of dietary habits and drug addiction we are equipped with a good scientific yardstick which evaluates them in the true light of reality and science. The preferences and opinions of people who persist in certain habits can obviously be neglected since they are acting under the influence of the tyranny of the habit. On the other hand, a mere decision of scientific experimentation that a certain practice is harmful does not bestow upon us the magic key to the implementation of the decision. Between the scientific conclusion and its incorporation into practice lies the vast complexity of human nature which must be mastered for proper control or manipulation. One thing seems certain. Proper allowances must be made for fancy and for the human desire for intangibles in flavor. Scientific requirements and values constitute only one element in the equation. To master that component, we must recognize its nature. We must remember also that we have made no contract with Mother Nature to endow man with only worthy motives. Nature is not always fully

providential and beneficently seeking the welfare of every living being. Hence, man may have certain desires and tastes which may not serve his ultimate welfare. These must then be studied and suitable methods devised for controlling or eliminating them.

Chapter XV

Table Manners

We have seen that man's behavior creates in him habits which become second nature. Customs and procedures different from his own then appear strange and even laughable. In the same way, food to which he is unaccustomed does not appeal to his taste and will fail to satisfy his hunger. Novel dietary items of singular merit may often provoke insuperable aversions in him to his own detriment.

The same process seems to operate with regard to the manner of eating. We are all inclined, for example, to view with distaste anyone putting food in his mouth without the use of knife and fork. Many people consider it the height of indecency to taste food without uttering a prayer. Similarly we are genuinely irritated by people deporting themselves at table in a manner wholly contrary to our customs and our notions of dignity and propriety. Our manners are, of course, entirely arbitrary, and can be judged objectively only in terms of their hygienic values. Historically, however, human fancy rather than hygiene dictated every aspect of man's manner of consuming food and gave rise to his ideas of fashion and propriety. It is in fact likely that science may never be able to eradicate subjective values and subsequent emotional reactions.

We are familiar with the chopsticks of China and Japan which, clumsy though they may seem to us, have served their manipulators quite well for many centuries. One may even claim that they entail much adroitness and delicacy as compared with the crude and matter-of-fact tools employed by us. Equally noteworthy is the absence of tables and chairs in oriental dining rooms. One might say that their manner of sitting does away with the need for the cumbersome obstructions which we call dining-room furniture. In reality such

furniture may be only an effective means of depriving newlyweds of hard earned money and of giving them in return cramped quarters, surfaces for the collection of dust, sharp corners to bump into, and a general headache cured only by a ruinous sale after several years' torture. As a rule these indoor barricades are replaced with more sensible and more practical furniture costing much less and offering more breathing space in rooms that are too small to begin with. Yet so strong can the force of habit be that a Japanese home may seem vacant and primitive to us. We may be certain, however, that eating in their fashion is just as comfortable to them as our habits seem to us.

Hindus eat without any instruments whatever, yet manipulate their fingers so skillfully that no sooner has one overcome one's provincial objections to differences in custom than the gracefulness involved becomes apparent. Because of Hindu fear of interdining, the social aspect of eating is virtually secretive and most intimate. As with all other activities, religious rites and prohibitions rule every gesture and action relating to food.

No stranger will even glance into the kitchen or dining room. An American observer writes: "I never once saw a single Hindu, except of the lower caste, either preparing or eating cooked food of any kind . . . the merest glance of a man of inferior caste makes the greatest delicacies uneatable and if such a glance happens to fall on the family supplies during the cooking operations, when the ceremonial purity of the water used is a matter of life and death to every member of the household, the whole repast has to be thrown away as if poisoned. The family is for that day dinnerless. Food thus contaminated would, if eaten, communicate a taint to the souls as well as the bodies of the eaters—a taint which could only be removed by long and painful expiation."

It has already been indicated that these laws of segregation need not seem altogether strange to us. They exist in our own society regarding Negroes and other racial groups though to a lesser extent. The citation from the Bible given in Chapter II shows their prevalence in ancient societies. Some customs and institutions have a way

of persisting in spite of great peripheral changes. Change can, however, reach the core and often does.

The ancient law of India according to Manu states, "One should not sit in a lonely place with one's mother, sister or daughter for the senses are powerful and master even a learned man." The Hindu wife must vigilantly serve her husband while he eats. The wife, "must live in the women's apartments, keep her face veiled when her brothers-in-law are present and never be seen speaking even to her husband in the daytime."

An American author, describing the Hindu of only fourteen years ago, writes as follows: "I remember being invited by a prominent member of the Indian National Legislature to his home. He was one of the most cultivated men of the country and a leading patriot. Dressed in a cloth of white across his chest he wore a holy thread—the outward sign of the high rank with which he lives and dies. On his forehead was piously inscribed, fresh each morning, the monogram of his god, and in his hand he carried a pot in which he brought his daily meal. I knew enough not to touch the vessel. For had I done so he would never have used it again. We talked many times and he was a brilliant conversationalist. He was very courteous, but I could never ask him to dine with me. As an orthodox Brahman he could not eat at the same table with a beef eater."

Because food is at the very core of Hindu religion, Mohammedans in India seek to win converts by inducing Hindus to eat in the company of Moslems food prepared by Moslems. The performance of this act indicates rejection of the Hindu faith. A rather critical Mohammedan wrote: "The worst that could be said of a Moslem was that he had a tasteless mess which he called a dish for kings, and wanted all to share it with him, thrusting it down the throats of such as did not relish it and would rather not have it, while his Hindu brother who prided himself on his cookery, retired into the privacy of his kitchen and greedily devoured all that he had cooked, without permitting even the shadow of his brother to fall on his food, or sparing even a crumb for him."

The extent to which food plays a role even in modern Hindu

society can best be seen from the following statement printed in a letter to Gandhi which was published in his *Young India* of 1926. "Some Hindus have religious scruples against having water at the hands of meat-eaters, some against doing so at the hands of beef-eaters. It therefore happens that some Hindus do not take water from Christians, Mussulmen and untouchables alike. Let them (the untouchables) take the promise to abstain from beef or carrion as a preliminary to their being taken into the Hindu fold."

The Hindu draws a sharp distinction between food cooked in water and food cooked in melted butter or ghee. Water-cooked food is sacred and subject to all the restrictions cited. On the other hand ghee being a product of the sacred cow is so holy that it simply cannot become contaminated, hence can be looked at by untouchables and Christians without harm.

His table manners differ radically from our own. "Before eating, an orthodox Hindu should wash his hands and feet. He sits down stripped to the waist except for the sacred thread; and he can eat with no one who is not a member of his own endogamous circle, *i.e.,* caste and sub-caste. . . .

He rolls up his rice into a ball of convenient size and holding his head back, pops it into his open mouth without his hand touching the latter. Similarly it is quite common to smoke a cigarette without putting it between the lips. . . . The Laws of Manu forbid the twice-born to eat domestic fowls, onions and garlic, turnips and carrots, salted pork and mushrooms. . . . Other castes abhor lentils and tomatoes because their color resembles blood."

Tasting one's own saliva which had been out of the mouth is considered the vilest abomination. It is for this reason that cigarettes are not smoked in our fashion. Water is drunk from a cup by thrusting it into the mouth without touching the lips to the cup. Seeing it done our way creates in Hindus a strong sense of revulsion and abhorrence.

The fear of the "evil eye" or of envy has brought about a large number of curious eating habits. Many African tribes believe that the act of eating must be hidden from the eyes of others, especially

strangers. "Everywhere in northern Abyssinia," writes a traveller, "people, when they eat, are hidden from public gaze by having sheets hung over them." At wedding feasts guests eat in groups of four or six, each group covered with a sheet.

The Maoris of New Zealand oblige each man to eat apart and never to touch food with his right hand. Women may often eat together but not men. All eating must be done in the open air because food pollutes the house. This feeling of shame at being seen by others in the act of eating is not limited to savages. In ancient Greece and Rome even the poorest ate behind closed doors. According to the historian, Herodotus, who visited Egypt and studied the customs of the people, the Egyptians felt no repugnance at public eating. They claimed, he records, that "ugly and low things should be done in secret but honest ones in public."

In most of Australia and Polynesia women are not permitted to eat with the men. This is also true of all Mohammedan lands. The custom also prevailed among the Aztecs of Mexico, where the men ate first and the women after them. We must not forget the widespread practice of the avoidance custom which declares that a man may not be in the same room, look at or speak directly to his sister or mother-in-law. The citation from the book of Manu given above may offer one possible reason for this prohibition. From this custom to the prohibition of eating together is not a far cry. For that matter, in some tribes the law requires that men must never be out of their houses at the same time as women. In many parts of Africa and in other regions women must not see men in the act of eating. In Polynesia women may not cook over any fire that had been used by men.

Mohammedan women never sit at the table with men and never partake in their discussions. "An impenetrable veil of ignorance and obscurity separates her from the world." Among the poor some sociability between the male and female members of the family is inevitable but among the rich who can afford larger living quarters it is never the case. Moreover, these practices are more matters of custom than creed so that the rules are not the same in all Mohammedan

countries. In fact, among the Tuareg of Sahara, the men wear veils, the women do not and are generally on an equal footing with the men.

In many Indian tribes of South America the men never eat together with their wives. The same custom prevails among many Negro tribes of Africa. A visitor to the Upper Congo writes: "All the food was cooked together and then divided by the woman-cook into two lots, one for the males of the family and the other for the females. They never ate together. If stress of weather forced them to seek the shelter of a house, the males took one end of a building and the females the other end. The boys and girls would eat with either party." In Central Africa, too, men and women never eat together and a man never talks in public with his wife. Elsewhere in Africa a man will eat with his wife and children if the family dines alone. But should male guests be in the house, the woman eats by herself. To some extent this is even practiced in some parts of Europe.

The Todas of India, for example, eat only twice a day. The men do the cooking and eat in isolation before the women can eat. They do not like to be seen eating for fear of "evil eyes." Elsewhere, as in Samoa, women prepare the food but the men do the cooking in accordance with custom. But their cooking differs somewhat from our technique. Their oven is a shallow pit in a special cookhouse. They obtain fire by friction, achieved by rubbing a hard piece of wood against a softer one until the surrounding sawdust is ignited. Stones are placed in the fire, and when they are quite hot the ashes are cleared away and the food is put on them, covered with leaves, and left to bake. Not having any pottery, they fill their wooden vessels with water to which other food may be added. Red hot stones are dropped in and the mixture is allowed to boil.

The kings of the African Buganda or of Dahomey are practically absolute rulers over their respective tribes and all their subjects' possessions. Because they are holy, no one may see them eat. Even the queens who serve them must turn their backs while the rulers are eating. The remains of the king's food must be thrown to the dogs.

The reason for this precaution, as has already been mentioned, is the belief that with the aid of magic one can obtain great power over a person if one is in possession of food of which the person in question has partaken.

Among the Plains Indians it was a serious breach of etiquette for a guest to have any leftovers. A visitor was even expected to bring a container with him and take things home. Among the Crow, guests sit apart from the host, each family group dining by itself.

Such details may be recounted by the hundreds. What is important to note, however, is that primitive man not only thought and reasoned in his own fashion just as we do, but had far stricter and more detailed rules of table manners than we have. If anything, we are more liberal and tolerant, more critical of regulation and more considerate of individual taste and the importance of comfort. We must stop thinking of primitive or ancient man as a "savage." Apparently the savage is more orthodox and set, more encumbered with rules and regulations than we are, or at least as much so though in different ways.

It is quite apparent that table manners, like all forms of social conduct, have been subject to rules of etiquette and notions of propriety since man's earliest social life. Yet though even the washing of hands before and after meals was practiced among many tribes, early manners seem laughable to us in the light of our knowledge of hygiene. Privacy of plate or spoon was unknown, hands were dipped in the common bowl and food was passed from mouth to mouth. Irrational proprieties were meticulously guarded, however, once they had become custom.

We often encounter societies which duplicate the Hindu system of prohibiting certain foods to each of the different social castes or classes. In India many Brahman sub-castes may not eat meat and the Shudras or the lowest caste, comprising the majority of the Hindus, are forbidden to eat ghee or melted butter. Among the ancient Incas of Peru the food prohibitions for the different classes of society were based on social values that are particularly abhorrent to a democracy.

The Inca state is considered by many the forerunner of a fascist-

communist economy in which the individual's thoughts and acts were completely subservient to the state. In return, every citizen was fully provided with the necessities of life. On reaching the age of five, boys and girls were taken away from their families by the government and trained for their future occupations. All men married at twenty-four, women at eighteen. The number of youngsters assigned to a given occupation was determined entirely by the need. Each town or village had its allotted trade or industry.

The common people paid tribute to the Inca, the nobles, officials, and priests in the form of a fraction of their produce. To maintain regulated production and consumption, so-called sumptuary laws came into existence. These limited the common people's dress to plain cotton and prescribed their foods. Finer fabrics were prohibited to them and forbidden also were delicacies, strong intoxicating beverages and coca. These were reserved for the officials and nobles. Infringements were cruelly punished. A college existed only for nobles so "that the children of the common people should not learn the sciences, which should be known only by the nobles, lest the lower classes should become proud and endanger the commonwealth."

Of course, traces of these regulatory prohibitions existed even in our society during the middle ages but food prohibitions never became quite official. No commoner could wear a sword or the garments of a nobleman. In India the caste system is based on food restrictions as much as on the manner of dress, mode of prayer and social status. But with the Incas it all fitted into the idea of a powerful and regulated state.

These points are of special interest today when Hitler and his Nazi party are aiming at a sinister combination of Peruvian and Indian food regulations. Through their rationing system, they control the quality and amounts of food they wish to give the oppressed nations of Europe, and actually prohibit certain foods such as citrus fruit to Jews, Poles and Serbs. Even dress is being regulated through the arm bands and other compulsory insignia. Segregation has been introduced and enforced for some time. Food is playing as fantastic

a role in the Nazi system of slavery as it did among the primitive cultures of the past and still does in those of the present.

In our own democratic society matters are far different. Eating is a festive social occasion for the family and friends, for societies and clubs. In fact it plays a part in all kinds of celebrations. Just as some American Indians wished to smoke their tobacco in company exclusively, so do we want to eat in the company of friends, and many of us even dislike having to eat alone.

Because we attach importance to eating and endow it with emotional quality, we have evolved numerous manners and procedures regulating our conduct at the table. There is the prayer or toast, the freely flowing conversation, the friendly passing of dishes and general good humor. In some countries it is also an appropriate occasion for song and story telling. We also like to believe that most of our manners aim to help conviviality and minimize irritation resulting from crudeness, thus maintaining group enjoyment. At the same time our table manners, though aiming at sociability, are kept within the boundary of hygienic rules based upon medical science.

It was only a hundred years ago that the common bowl was to be seen on every dinner table and individual spoons were dipped into it. Napkins were far from popular and mouths were wiped on sleeves which thus became coated with food and converted into media for bacterial growth and decay. For that matter, even the fork is only about three hundred years old and, like all other innovations, did not find ready acceptance.

The fork was introduced into England at the time of Queen Elizabeth and came from France where it had gained popularity at the court. People in England and elsewhere had many objections to it which were not as ridiculous as might appear at first. The same objections are still raised in many rural sections of Europe and Asia where eating by hand is still practiced. It was claimed that the fork was vulgar since it resembled the instrument used by the peasants to load manure on wagons. Others said it was a dangerous weapon to have in the house, especially if children were around. Some were afraid that after one put it in the mouth with food, one could never

tell whether it might not come out with the tongue or cheek. Yet these same people ate bread or apples with the aid of a sharp jackknife. The piece of bread was held near the mouth with the left hand while the right, armed with the knife, dexterously cut pieces that rolled into the mouth. The fork finally gained entry into English society when the prestige of French court manners won the approval of Queen Elizabeth. After the fork had made its appearance on the royal table, the courtiers followed suit with their usual speed in such matters. The next step was then inevitable. Eating with the fork became fashionable and the novelty thus became part of our table manners.

Some of our table manners did not come in being by mere chance. They are definitely the result of medical science and hygiene. After the world had learned seventy years ago of the dramatic and far-reaching experiments of Pasteur and of the surgical advances of Lister, the desire for hygienic habits spread like the current fads for colored nail polish or eyebrow plucking. Science in those days had glamor and appeal. Those were the days of nineteenth century optimism when people believed that education and science and economic improvement would produce an era of progress, true brotherly love and universal justice. Science was admired by all and scientists held the limelight as glamorously as movie stars do today. With such widespread approval, it was no wonder that the science of hygiene had easy sailing.

The speed with which interest in nutrition has caught the public fancy within the last two years or so may well be compared to the spread of sanitation in the last century. This, of course, is a hopeful sign. But without guidance, not only may the movement lag, but it may fail to maintain its proper direction, a task more difficult and subtle than the maintenance of the simple rules of hygiene.

One may also be gratified by the frequency of our daily repasts, namely, our three-meal per-day habit which seems to be as desirable as the sociable nature of our meals or the hygienic merit of our table manners. There are numerous tribes that eat only two meals a day, others only one, usually in the evening. These peoples have done

fairly well and are of good health and physique. Certain it is that habit is a major factor in this matter just as it is with the amount of food the body is accustomed to consume at any meal or during the entire day. Yet, recent experiments have shown that greater efficiency at work is obtained, which means that fatigue is best overcome, by in-between meal feeding, hence, by even more meals than three a day.

Generally speaking then, in the matter of table manners the trend of our society has been in a desirable direction. Our communal eating is a good institution which we should retain and develop. Our code of table conduct has also been reasonable and in accordance with hygiene, mutual respect and general conviviality. Our discomfort in eating with people who disregard our elementary niceties can be justified by science as well as by custom. Hence, hand in hand with the improvement of diet in accordance with welfare and science must go extension of the social enjoyment of food, convivial behavior and hygienic practices.

Eating places must be pleasing and relaxing whether they are in factories, on Broadway or in field tents. The act of eating must not be made into a chore, an ordeal or a race for speed. Cleanliness is as desirable for its pleasing effect as for its hygienic merits. The psychological gratifications derived from these aspects of food are as important for health and welfare as are vitamins or minerals.

Chapter XVI

Food and the Nature of Man

One should not be surprised to discover that the material presented in the foregoing chapters leads to some perplexing thoughts on the subject of human nature. We have all been accustomed to believe in the economic man, wisely guided by biology and necessity. Yet here we are confronted with a display of facts which obviously prove how little evidence this widespread notion can muster.

For that matter the same is true of the general notion of human progress which evolved during the hopeful years of the eighteenth and nineteenth centuries. It was assumed that man learned readily by experience, and invariably employed the method of trial and error, thus necessarily growing wiser as the centuries rolled on. Progress was inevitable because reason and the method of trial and error made it so.

There is, no doubt, some truth in this statement, but it is at best incomplete and somewhat superficial. Anthropological studies of man and of his different customs, beliefs and institutions indicate clearly that every human group develops its own culture, its set of practices and beliefs, its particular language and forms of art. Regardless of how much a given group resembles at first a mother or sister group, it will, if isolated, evolve its own specific culture. Change is the law of nature in social matters as well as in biological aspects.

Consequently, each human group develops its own customs and traditions, its peculiar values and beliefs. This is the culture pattern, the form of life and conduct into which all members of the group readily fit, just as our organs of speech fit readily the needs of the language we have been brought up to speak. Because people are born into their particular pattern, they view it as human, normal,

and natural; as logical and desirable. Hence, changes are resisted, not by the deliberate desire to be conservative, or merely to defend vested interests, or out of envy and dislike of innovators and their work, but because of the very nature of man's response to the habitual and his unwillingness to accept the strange and the novel.

This phenomenon creates an inertia and a conservatism which are not mere sentiments or the mechanical expression of vested interests but well rationalized mental attitudes. This we may call the culture trap. For example, to all Hindus caste is a legitimate, logical, desirable and thoroughly natural institution. They can defend it with numerous arguments and, in their eyes, perfect logic. The Nazi cannot understand how anyone can fail to see that liberalism and Christianity are based on laughable values. The American pioneer had numerous defenses for his desire to eradicate the Indian.

It was taken for granted, as Benjamin Franklin puts it, that it was "the design of Providence to extirpate these savages in order to make room for cultivators of the earth." Cotton Mather believed that "probably the devil decoyed these miserable savages hither in hopes that the gospel of the Lord Jesus Christ would never come here to destroy or disturb his absolute empire over them."

On the other hand, White Cloud, the Indian chief, saw the problem from a different angle. "Why did the Great Spirit ever send the whites to this island to drive us from our homes and introduce among us poisonous liquors, disease and death? They should have remained in the island where the Great Spirit first placed them. . . . My reason teaches me that land cannot be sold. The Great Spirit gave it to his children to live upon and cultivate as far as is necessary for their subsistence; and as long as they occupy and cultivate it they have the right to the soil—but if they voluntarily leave it, then any other people have a right to settle upon it. Nothing can be sold but such things as can be carried away."

The culture trap operates to make us view as natural that to which we are accustomed, to make us justify and defend with complete honesty and sincerity that which habituation has conditioned us to regard as natural. Hence, customs and habits or for that mat-

ter cultures in general, act as traps. Those people raised under their sway will automatically tend to defend and perpetuate them. Necessity and self-interest may help to break the trap but do not do so necessarily, and harmful institutions may last for hundreds or even thousands of years. On the other hand vast changes are often introduced by totally accidental and incidental forces.

The same is true of the spread from one culture to another of human institutions, such as Christianity, architecture, dress or games. Some diffuse with ease and rapidity. Other institutions, though wholly beneficial, may meet with insurmountable resistance.

These phenomena present extremely difficult problems in the study of man, and the sciences involved are far from shedding much light upon them. On the other hand, if we succeed in understanding and mastering them, we shall be in the very fortunate position of exerting great influence upon the course of human progress.

Not many students of society have paid much attention to the subject of food because it was almost taken for granted that eating was a straightforward, biological phenomenon controlled by instinct, necessity and availability of material. The incidents here considered demand a different point of view. It is easy to see that food plays an entirely different role in human life from that in animal life. With man eating is no more mere biology than is his conduct in matters of sex. Both are surrounded with social institutions which vary from group to group and from culture to culture and which penetrate our notions of what is moral and immoral, human and inhuman. We have just as definite notions of what is indecent in dress or social relations as we have about the propriety of rats and earthworms as human foods, or the natural immorality or undesirability of polygamy or incest.

While other institutions of man are subjective and cannot be evaluated with absolute certainty, food can be so approached because its scientific yardstick is relatively objective. Hence, man's dietary conduct presents excellent experimental material for the study of human behavior with regard to custom and belief as well as the nature of progress. As such, the study of man's food, its rhyme or

reason is a study in human behavior. It is ideal because it can be scientifically evaluated. This means we can look at ourselves objectively and truly observe how strange, how ludicrous, how stupid, or how wise and well adjusted we are.

To begin with, we readily see that a diet pattern becomes established by the same forces that determine the establishment of any other institution. In some cases an easily available food becomes the staple and happens to be a vitamin-rich food. In other cases it may be a poor food. Elsewhere ready-at-hand sources are overlooked and much effort is expended to obtain less plentiful foods. But in either case, once some staple is established or the manner of preparing it, the habit clings and persists so that it is modified with difficulty.

Of course, changes in diet do occur, but so do changes in all other culture elements. These changes are sometimes beneficial but they may also be harmful. Occasionally, seers or scientists seek to advance some worthwhile practice or try to stop a bad one from spreading and fail. Sometimes they succeed.

Such is the history of human society and most of its institutions. Uneven is the course of man's development, devious his road of evolution. It may wind up or down in a direction we choose to call forward or progressive but often also in a backward or retrogressive one. In matters of food, however, our judgment of progress is not subjective but concrete. Yet the course is the same. Diets do not necessarily become better with time. They improve with wealth only because more money spent on food offers a greater variety which in itself is a virtue though still requiring some attention for their proper regulation.

The story of man's food, like the story of all social institutions, indicates how artificial or how relative our notions of esteem or contempt can be. Eating or serving horsemeat may in one case bring prestige, in another excommunication. The sight of beef or chicken meat may inspire in one culture a pleasing sense of hunger, in another disgust.

Lack of consistency need not disturb man in the slightest. The mind is the most malleable phenomenon in nature. It can be made

to accept urine as holy but can also be moulded to regard meat as nauseating. Moreover, little logic is employed. The cow may be considered pure but not the ox or buffalo or vice versa. Delicacies of the past may become the abominations of the future. As with racial prejudice or social snobbishness, it is the present that prevails and past records are of no avail in changing the verdict of current values and fashions.

It is also worth noting that food taboos, like other social institutions, usually have more than one cause. A taboo may become established because the animal is a totem, or because it resembles some other animal already in ill repute, or because its name may inspire some evil association, or it may symbolize an undesirable quality. Often animals become tabooed simply because they are not eaten. Thus, some people will refuse to eat shellfish because they had never eaten it, being situated far from a source of supply. Our taboo against dogmeat or horsemeat certainly springs from the fact that we have not hitherto eaten the flesh of these animals.

For this reason it is apparent that should we succeed in changing food habits in accordance with science, we shall have made a most significant social contribution. We shall have proven that it is possible for a preconceived and well-guided scientific belief to replace haphazard and harmful practices. Once we learn the technique of achieving that goal in one social sphere, we shall be able to do it in another. If we can do it with food habits, we may be able to do it with blind, disruptive prejudices and superstitions, antisocial movements and fads. We shall also know which circumstances and factors aid the processes of change in belief patterns and which hamper them. Thus, progress may be truly assured and science cease to be a neglected, prostituted or abused social power.

This task may not be at all easy. Numerous are the aspects of human behavior woven into the simple pattern of eating. Those facile explainers of human conduct and social evolution who no sooner learn of a historic event than they immediately offer a streamlined explanation in terms of economic necessity or similar for-

mulae, might do well to pause and consider. Many are the people who regard eating as unworthy of discussion because it is as plain as daylight to them that it is nothing but biology in its simplest form. But this, as we have seen, is far from the truth. All we can say then is that if eating can be so complex, what then should be said about such social passions as nationalism, faith, fascism, racism or communism?

There are people who fear that the view of science and progress here presented is nihilistic and detrimental to society. They believe that one should speak of progress in terms that were more familiar in the past, such as man's glorious rise to power, marching proudly forward and the like. They would want us to retain the nineteenth-century picture of ancient man as a half-witted brute whom we in no way resemble because, armed with the weapon of science, our ancestors began to trek which brought us to the wondrous heights we occupy today and from which we can look down with tolerant curiosity upon the dark past.

The conclusion that many excellent foods or that many desirable social institutions come to us haphazardly in no way interferes either with man's quest for a better diet or with his more intensive quest for a better world. On the contrary, the truth puts both on a sounder basis. It teaches us that good foods or institutions which happen to come our way must be carefully cherished and defended or else they may be lost, not to be recovered for many generations. Similarly, evil institutions like Nazism or caste food habits must be bitterly opposed at their very inception lest they enter our culture pattern. Once that happens, we become caught in its trap. The new generation then accepts these customs as natural and human just as the Hindus accept the necessity of destroying food that met the gaze of an untouchable or a Christian, or as our white South accepts the necessity of not eating in the same restaurant with Negroes.

Mankind has always maintained spiritual and social values which have played a major role in human fates. Without these values, which are incorporated into such documents as the Bible or the Bill of Rights, man seems to find civilized life impossible. But the posses-

sion of these values need not blind us to the dictates of the science of man which alone can teach us to implement at will desirable changes and eradicate harmful trends. The very fate and utility of these values depend upon such knowledge.

Chapter XVII

Food and Morale

In times of war the entire subject of nutrition assumes vaster proportions and deeper significance than ever before. This is total war in which the entire totalitarian nation is mobilized as a war machine and its entire wealth of science pitted against humanity. A fanatical belief that spread like a plague, which infected considerable fractions of two industrial nations, Germany and Japan, and agricultural countries like Italy, Hungary or Roumania, has stirred their governments to launch a campaign of conquest, oppression and enslavement. These are the slogans they wish to inscribe on the pages of history in place of liberty, equality and fraternity. The consequences of their initial successes are only a sample of the tragic meaning of their goals in practice.

Their weapons are coerced masses of robots guided by the fanatic believers, aided by the latest achievements of science and exploited to serve their aims. "Guns instead of butter," a slogan dealing with food, was the opening blast of the Nazi campaign of preparation. They knew that for purposes of training their people for murder and exploiting science to the fullest, nutrition was the best starting point. Its essence encompassed both the people's mental attitudes to food which had to be broken and the need for scientific efforts at maintaining health by appropriate changes in diet.

Their next step was the command to live on Ersatz or substitutes. Having been forced to give up their sentiments, spirit and food traditions the public was trained to accept novel foods artificially supplemented or concocted. The foods normally consumed—the sugar and fat, the meat and wheat, the vegetable oils and milk, were either used directly for the making of war materials, exchanged for such

elsewhere, or were cached for the later needs of their fighting millions. Henceforth, regimented menus were ordered and obeyed.

But we must not believe for a minute that the health of their people was allowed to be undermined by these dietary ravages. Science is a servant that follows any master. It is like a knife that can be used for cutting bread for the hungry or for butchering the innocent. The knowledge of vitamins and minerals was meticulously employed to balance the nation's diet so that health was maintained. Their preparation for total war was thorough and methodical.

In fact, it is the thoroughness of the Nazi and Japanese schemes for conquest which make them the dangerous enemies they are. They are wholly unhampered by decency and human values. With ruthless precision they carry out their plans in matters involving food as in any other activity. All conquered nations are reduced to the level of slaves with appropriate caste treatment in the form of low but graded rations. Since all food is confiscated by the conquerors, starvation as a penalty becomes an easy matter.

Having explored all the cruelties and hideousness of the past, the Nazis are seeking to establish a caste society with the Germans as Brahmans, the Jews as untouchables and the other European nations graded in between the two extremes. To semi-medieval Japan, a caste society comes naturally. With the thoroughness of premeditated murder all the dietary notions and superstitions of primitive caste societies are now being introduced into Nazi-dominated Europe. They are, however, purged of the old irrational beliefs of what is an abomination and what is not. Instead, the lower castes are merely forbidden vitamin-rich, protective and delicious tasting foods. This is dietetic science with a vengeance. Never since the ferocity of the Tartar invasion of Europe has a human philosophy or even an outright plan of conquest approached this goal of thoroughgoing evil.

Not only on the production line is science employed in this war. Nazi warfare unleashed against us involves not only tanks and planes, submarines and magnetic mines, but the science of nutrition as well as exploitation of the crudest of primitive concepts of food that were ever employed in maintaining caste or slave societies.

It is obvious that science must be matched with science if we are to win. Justice alone does not conquer and evil does not perish of itself. Hence, we should consider the science of nutrition with utmost care so that democracy can wield it with greater effectiveness and ingenuity than do the enemies of humanity.

There is first the matter of food for strength and efficiency. Whether in war or peace, we must bear in mind that democracy does not imply a static but a changing society, with the source of change residing in the needs and will of the people. Far be it from us to claim that our youthful democracy had achieved in the past all the goals its founders had visioned. It has not only groped for satisfactory realizations of the clearly outlined objectives contained in the Bill of Rights but has even sought, as in the last decade, to extend these goals beyond their original intentions in response to new needs and difficulties.

The nutritional status of our people is a good illustration. As high as our average standard of living has been by comparison with other countries, we still had enough economic eddies, enough unawareness of the newer knowledge of nutrition to produce as high a fraction of physical deficiency as the draft rejections tend to indicate. Under normal conditions this state of affairs is alarming. In wartime it is a menace to victory.

The next point to be remembered is that about seventy-five percent of our nation have poor dietary habits as is demonstrated by reliable surveys. Poor diets are food combinations which, if maintained for long periods, must inevitably lead to a poor state of health. Hence, people who show visible dietary deficiencies and those who possess subclinical symptoms without displaying obvious signs of disturbed functions, can all be said to have been affected to various degrees by bad food habits.

Reasons need hardly be given for considering such a state of affairs a national calamity. Apparatus that could profitably be employed for other work is producing vitamin pills. Money that should be spent on essentials is needlessly spent on sound or valueless medication. Doctors needed by the armed forces are withheld for the civil-

ian population. Time needed to produce the implements of war is lost through sickness. Men needed for the armed services remain at home and nurse whatever physical disability kept them there.

Our war tasks require greater than normal strength and endurance for needed overtime and for work on shifts to which most people are unaccustomed. If the men on the production line constitute our army in overalls, our homemakers form our third army, the army of the home and kitchen. Our workers must be well fed and of high morale to be efficient. Whether in war or peace, the health of our nation must not be weakened by the follies of unscientific habits or the menace of superstitious fads.

The vicissitudes of war demand not only immediate improvement of food habits but also a flexible public. We must supply food to our fighting allies, Russia, China, England and others of the United Nations. There are bound to be shortages here at home and sporadic surpluses, when for one reason or another lend-lease material fails to be shipped. Moreover, extensive rationing and shortages are inevitable as is also the need for greater consumption of seasonal foods to diminish the necessity for canning with its consequent drain on vital war materials. Transportation difficulties will also impose dietary changes. These irregularities must not affect our daily consumption of the basic food elements. Knowledge of the food groups and of the true values of foods makes replacements and needed adjustments an easy matter.

But this is more easily said than done, as we have seen. Neither adjustments to war needs nor changes in food habits can be accomplished efficiently by decree.

Democracy must prove its mettle in the face of this challenge. Here is a crucial test. Can an enlightened people, fully aware of the fact that its very existence is at stake, rise to the task of mastering its habits so as to make thereby its indispensable contribution to victory? Is the democratic method of introducing sound nutrition through a people's movement to prove less successful than Nazi decrees of meatless days and commands of one-dish-Sundays? The answer lies with the men and women of this country.

Nor must we forget the morale-building value of a volunteer nutrition movement. The homemaker does not want to be left out of war duties. Here is a specific task in which her own immediate interests merge harmoniously with the national welfare and the war needs. Besides, the nutrition movement of any community brings together all sections of the population with a common objective into unity, creating a strong civic and democratic spirit.

Our nation consists of many racial and national groups. These frequently retain their dietary heritage with the result that our total national dietary is the richest and most varied in the world. It is unfortunate that many people have gained the impression that sound nutrition means abandoning cherished or traditional foods and replacing them with artificially concocted and tasteless ones. It is likely that the enthusiastic preaching of some nutritionists has helped give that impression. In any event, it must be destroyed.

Sound nutrition does not demand of any group that it give up its traditional dishes. It merely demands supplementing and balancing. There are a thousand ways of obtaining a bad diet and a thousand ways of designing a good one. No tastes need be violated and surely no traditional rules or national habits. The science of nutrition permits much leeway and like most knowledge offers freedom instead of the slavery of poor habits.

Scientific nutrition can be a practical testing ground for tolerance. There are different roads that lead to a common goal and in the course of the common search for it, much is learned about other people and groups. Different national groups working together in a community will learn to know each other by cooperation, will learn new dishes and recipes, learn tolerance and true democratic unity. Besides, knowledge of different tastes and practices is a strong factor in weakening the bonds of one's own habits, thus permitting the entry of novelty.

Active and intelligent participation in a nutrition campaign creates in adults an interest in a phase of life which may rightly be regarded as educational. Such interests are desirable in a democracy and should be fostered because they make for an alert and enlight-

ened electorate. It also has individual repercussions. A housewife who acquires even nontechnical nutrition information and can employ it to any degree in the home is bound to gain in dignity and be respected by her husband and neighbors alike for doing a good job for her own and her family's sake and for the nation's welfare.

Too often have people, both as individuals and authors of philosophic movements, sought to solve problems by putting all blame on some other group or person. It has been applied to the problem of the prevalence of malnutrition as readily as to the existence of war or of race prejudice. Familiarity with the facts, as for example those relating to food habits and their bearing on man and society, has a great lesson to convey with regard to such an approach. It can teach us that many of our social evils require study instead of hasty condemnation of certain individuals or groups, and occasionally require even criticism of ourselves, reluctant though we usually are to do anything of the kind. As the evidence here presented indicates, the key to sound and scientific nutrition is self-examination. This in itself is a valuable lesson in these days, when the secret to all solutions seems to be in finding some symbolic culprit and holding him fully responsible for all evil. Often an objective study of the problem may reveal that the devil is not all devil and that we ourselves are not all angels. Social progress within the framework of a democracy largely depends upon the development of such an objective attitude.

Special and immediate attention must be paid to the feeding of our industrial workers. Our girding for war has necessitated the rapid growth of large factories in towns of small populations. Living and feeding conditions become a serious problem which is being successfully met, though the task is far from complete. For that matter, an army camp is also a sudden gathering of large numbers of people in a region previously free from such crowds. But our mode of thought is such that we take it for granted that while an army must be fed, our industrial workers may still be permitted to fare for themselves. Our ideas on this score have not caught up with the needs of the times.

It is the task of a people at war, of management, labor organiza-

tions, the housewife, the neighborhood restaurant and the community to see to it that no stone is left unturned in the quest for the proper nutrition of our army in overalls. There is no use in feeding and maintaining our army in uniform if it is not provided with the needed weapons, and there is little use in building factories and expecting to surpass the Axis in production unless we see to it that our workers are well fed. The feeding of the industrial workers, like the financing of the war or the provision of our armed forces with the weapons they need, is a task of primary importance. Neglect of nutrition means loss of manpower.

The urgent tasks of the war also demand that we examine the residues of ancient food superstitions and some ancient dietary practices still rooted in our own culture patterns. How easy it is for us to marvel at the folly of the food rules of Hindu castes, and laugh at the stubbornness with which the amazingly cultured people of India, with so rich a tradition and so inspiring a heritage, permit ancient customs to hamper the fullest development of their national vigor. We forget our own social castes and racial barriers, our own segregation of peoples at meals, especially in our South, and other comparable follies.

There can be little doubt that the era of science which is now storming the outmoded moats and walls of our food habits will introduce revolutionary changes in our diet. Let us not allow this change to go as it listeth. While the process is in progress, while the new pattern is being fashioned and while it sends its roots deep into the soil of our culture, let us stand by and let the light of science and the Bill of Rights help us guide the new customs in the best manner we can muster to date. While rising to the height of self-criticism, let us exploit this moment for purging ourselves not only of those residues which science and democracy cannot tolerate, but also of all vestiges of the mentality of slave society and of theories of racial superiority and caste segregation. These are the institutions democracy has fought since the moment of its inception. It is today fighting even more bitterly their attempted return.

In conclusion let us take one brief but cautious glimpse into

the future. That nutrition will play a major role in writing the peace is quite clear to all by now. The ruins that are Nazi-occupied Europe are peopled with a starved and disease-ridden mass of humanity whose rescue will tax the resources of both medicine and nutrition. For some time after the war, countries that are now overrun and whose wealth lies in ruins will have to be fed. The supplies will come primarily from the American continents, though other countries will no doubt also contribute.

Be that as it may, our awareness of, and adjustments to, dietary requirements of this period will have to be maintained after the war. Educationally, that is very fortunate, because more time can only be of help in the successful introduction of scientific food habits. Besides, the deep-felt need to help reestablish the world we are to live in will add sustained motivation and will teach us the technique of cooperation.

But two aspects of this task are of inestimable value to humanity. First, the people will have to adjust their diets as a result of the extensive shortage of foods; the people themselves will actually be involved in the making of the peace. Under these circumstances the task cannot be left to diplomats and politicians alone. Whatever the terms of the peace to come, the people will have to be in on it. Their sacrifices and self-denials will be the price they pay for participation.

Secondly, the entire nature of the post-war world, its reconstruction and kind of international economy which is to prevail are basically linked with food requirements. It is clear that nutritionally, it is impossible for each country to be self-sufficient. Infants must get their vitamin D from the livers of fish unavailable in Switzerland or Hungary, to cite one example. On the other hand excess vitamins may have to be exchanged for proteins. While it is, no doubt, impossible to offer a fool-proof solution to the complexities of international economy, some consolation may be found in the fact that this facet of the problem offers some help. Active and intelligent nutrition movements of the people everywhere will form a sound democratic background. An international nutrition movement operating on a world-wide scale with the help of a scientific staff and enriched by

the hard experiences of the war will furnish the coordinating agency. This combination of an intelligent public with a skilled and experienced body of scientists and organizers cannot fail to solve a problem which will only be somewhat more complex than the task they fulfilled in wartime. Hence the people's nutrition movement and its coordinating agencies have the potentialities for truly writing the peace of the world for some time to come.

But the problem goes even deeper than that. "Freedom from want . . . for all men everywhere in the world . . . attainable in our own day and generation" is one of President Roosevelt's four freedoms which constitute our war aims. Freedom from the basic want of sound nourishment can undoubtedly be achieved by such a movement at such a time. The situation could never be more favorable.

Freedom from want of food is no remote fantastic goal if it is to be negotiated with the aid of the sciences of food and man, at a time when necessity is acute and people are willing to listen and cooperate. It will also be a time when, after what the world will have been through, there will be courage and a desire to build and tackle difficult but desirable tasks. Besides, the people everywhere will be part of it and through the nutrition movements will have had some experience in organization, in dietary adaptation and cooperation. This is no utopian hope embracing many complex aspects of man, society and the material world. It is sufficiently limited in scope and specific in nature to be realizable. Moreover, its complexity is now recognized and the component factors have been studied separately. The nature of man is not overlooked as it often is in utopian schemes and due caution has been observed. All these factors should make the effort well worth attempting.

It may not be amiss to suggest that we should prepare for this enormous task by taking the intermediate step of forming a Pan-American nutrition movement. Let this be our initial step of expansion beyond the borders of our country to see how twenty-one nations living now in peace and harmony can merge democracy with science and organization to bring the daily food needs to Pan-

American humanity in a spirit of cooperation and exchange. The nutrition movement has within it the possibility of joining the people in a common effort so that they will use their nutritional resources for a common objective of a sound daily diet for every member of society, preserving at the same time the better traditional food habits and customs. Success on the American continents now will be an encouraging prelude for the success of the effort on a global scale.

Chapter XVIII

Postscript on Freedom From Want in Food

Man's conduct in his quest for food involves, as we have seen, all the intricacies and complexities of human behavior. This quest is just as intricate as any other human institution, such as marriage, nationalism, human relations, wars, religions, and morals. If one's hunch is correct, the solution of man's food problems will no doubt be just as thickly strewn with obstacles as has been the solution of any other aspect of social conduct which has given humanity cause for hope and despair since prehistoric times. The words of the prayer, "Give us this day our daily bread," express the same depths of man's hopes and aspirations today as they did in Biblical times. In exactly the same way our hopes and pleas for justice, decent human relations, kindness to the stricken, the widowed and orphaned, security in old age, or protection from disease are still with us today as they have been with man since time immemorial.

But among other things, one of the unique features of man is his capacity and longing for faith. Men of little faith are rare and tragic. Just as no one is an atheist in the foxholes of a roaring, flaming battlefield, so can no man who is seriously troubled and pained, afford to be of little faith. Despair is the decay of death, and one actually has to feel oneself violently and irresistibly drawn into the finality of doom's embrace to adopt it. Before that stage is reached man will cling to any hope that he can possibly grasp and will even be grateful for mirages that may bring some consolation into view.

Man is a believing animal. He has always believed; and why not? Belief has eased his life and gratified his wishes. It has stimulated him to combat obstacles and has motivated him to seek greater horizons and real or imaginary panaceas. He has acted thus and will con-

tinue to do so in the sphere of social relations. He has acted so and will continue to do so in the sphere of economics. Often this has had undesirable consequences. In spheres of knowledge and thought this desire often leads to the affliction that Professor John Dewey calls "The Quest for Certainty" and that Professor Morris Raphael Cohen calls "The will to Illusion." Both may be harmful and wasteful of labor and effort, yet both are thoroughly human, perhaps inevitable, and certainly difficult to control.

But, if humanity is to go on hoping and explaining, why should it not, in these days of menacing barbarism and our own valiant though costly struggle for survival, indulge in more hope and planning for the future? Cynics may well ridicule it, and perhaps deservedly so; but what other weapon does the human mind have, and what harm is there really in it, if it is not enunciated with fanaticism and dogma but merely in a spirit of suggestion and inquiry? With this as an apology the following plan is offered as food for thought rather than for immediate consumption.

We are all aware of the fact that the nutrition picture in the world is far from satisfactory. In the United States surveys show that the majority of our population is malnourished—a small fraction because of economic reasons, a larger fraction because of bad habits, ignorance and laziness. If this is true for the United States, it is easy to imagine what the picture is like in most of Europe, all of Asia, Africa, Australia, and other parts of the globe. Deficiencies of suitable protein leading to stunted growth, lack of stamina, mental and physical diseases, rapid onset of old age and short life span; deficiency in vitamins, which is one of the causes for high infant mortality; excess of carbohydrates leading to many intestinal and metabolic diseases in most of Asia, Africa and elsewhere. This is the prevailing picture. Such it is when the population lives chiefly on cereals with little admixture of milk, meats, fresh fruits, and vegetables. Even in more developed countries where these deficiencies are not so severe, hidden malnutrition still prevails.

Economic maladjustments, vicious food habits, ignorance and indifference are menacing humanity everywhere. Poor health, high

infant mortality, low longevity, widespread disease, and other evils follow in the track of malnutrition. The cost to all nations is tremendous. The cost in human suffering is immeasurable.

Shortage of proteins, which is an invariable feature of war periods, leads to weakened resistance to disease. It is now fairly well established that for the production of antibodies, which are the substances that give us resistance or immunity to disease, an adequate protein diet is essential. Those antibodies are themselves composed of proteins and cannot be manufactured by the body when it is lacking in proteins. Hence the widespread reign of disease, plague and infection during and after periods of war.

If freedom from want in food is to mean anything at all, it is necessary that we begin to think about it right now. It is in times of war, in times of stress, anxiety and disturbances rather than under peacetime complacency that people are most willing to change. New ideas have a better chance of being accepted, and old institutional evils may be more easily eliminated. Besides, it is foolish to expect that on the morrow of the Allied victory people will wake up with a sudden determination to change their ways and to establish more harmonious human relations. The very contrary is to be expected. In all likelihood the prejudices, values, faiths, and morals of the past will, if at all shaken by the war emergency, spring back into their old molds and with renewed vigor. The training for postwar thought and conduct must come now in the day-to-day life of people at war. It should be a logical lesson of the war necessity, in itself a potent argument for inquisitiveness and open-mindedness as compared to peacetime smugness and indolence.

Now is the time to study the four enemies of sound nutrition for humanity: poverty; the chaos of trade; ignorance of nutrition; and indifference of government, which in democracies invariably means indifference on the part of the people themselves. None of these enemies of man's scientific nutrition can be overthrown by decree or by a valiant effort executed overnight. In fact, history indicates that because these items involve complex social patterns of conduct and are rooted in a multiplicity of beliefs and institutions,

their modification and their molding into a desired shape cannot be very easily achieved. It is for this reason that some practical scheme may very well be contemplated which has the virtue of being realistic, not too grandiose, limited to a specific task but possessing the virtue of modifying the whole picture through its unique composition.

It is common knowledge that the poorer the country the greater the percentage of its national income spent on food. People with incomes above $25,000 a year spend only about 8% of their income on food, while those with incomes of only $1,000 a year or lower may spend as much as 50% to 60%. The same is true of national budgets. Before the war England spent about 30% of her income on food, while the equivalent figure for the United States was nearer to 27.5%. In poor countries it may well reach 48% or even more.

Limiting ourselves to the United States, let us assume that the proper expenditure on food is to be 30%, since food expenses in the past had been too low for the lower income-bracket groups.

This money is spent on all foods, both essentials and luxuries. Let us consider these two kinds of foods. By essentials we mean all protective and energy-yielding foods within the eating habits of our population which are essential for the maintenance of health and wellbeing. They supply the organism with the known dietary requirements, and with ample leeway for unknown components. Under luxuries would then come food items which may please our fancy or add prestige to our status but which nutritionally are not essential and may even, in the opinion of some experts, be harmful. Thus, oranges, peppers, broccoli, cabbage, potatoes, yams, berries, cereals, fish, meat, eggs, milk, dairy products, bread, and the like would come under the classification of essential foods; while cake, candy, celery, lettuce, artichokes, cucumbers, cocoa, tea, coffee, soft and strong beverages, tobacco and others like them would come under luxuries. A luxury may be a very tasty and desirable animal or vegetable product but is not sufficiently endowed with known nutritional merit to make it essential. The assignment of articles to the two respective groups would be determined by a body of experts.

Suppose the country should attempt to guide its diet and health by means of an insurance scheme in which 15 or 20% of every individual's wages or salary is withheld at the source, the money going into a Food Supply Fund. In return for this money the individual is given coupons like our present ration cards in accordance with the size of his family. Adjustment in the deduction may be made where more than one member of the family are gainfully employed. Such action would depend upon the status of the fund or the will of the people. For that matter, if finances permit, reduction in payment may be introduced at any time. The coupons received by each individual are in seven colors, each color representing a different food group. At the moment nutritionists classify all foods into the basic seven groups. These consist of green and yellow vegetables; oranges, tomatoes, grapefruit, raw cabbage; salad greens, potatoes, and other fruits and vegetables; milk and milk products; meat, poultry, fish, or eggs; bread, flour or cereals; and seventh and last butter or fortified margarine. The seven sets of colored coupons would permit everybody complete freedom of choice within each group according to taste. Hence there would be no feeling of coercion. There would, however, be a certain amount of control which would guide one's food habits into secure, healthful channels, and which must in due time become fixed. Similarly, the prohibition of the free sale of opium or morphine produces a human stock that does not care much for it. The color scheme leaves all the freedom one desires within each group, and all groups can be made sufficiently large and varied to satisfy the most demanding. All food items of the luxury type would have to be bought for cash, in accordance with the wishes of the individual. The insurance pays only for the basic foods yielding essential ingredients. Which foods are basic is to be determined regionally, taking into account available foods and prevailing habits.

It is only logical that this plan would increase food consumption. The per capita food consumption of every nation in the world is below the level required for health. Moreover, the consumption of food will be protected and equalized, and the nation will be 100% well fed. There may be some waste, and to prevent it food

education will have to be conducted with that in view. It must also be borne in mind that no change in food habits can be effectively introduced by a scheme alone, no matter how nearly perfect it may be. People have to want to cooperate and must be made to understand the problems involved. Without an enlightened public little can be accomplished. But no public can be enlightened unless social circumstances permit the making of such a process possible and reasonable and help it materially along. By means of this plan food will be protected against the ravages of economic chaos. Yet the insurance plan as such ought not in any way to interfere with individual initiative and private enterprise.

Neither will it affect adversely the nation's industry or agriculture or even the role and wellbeing of the middleman. It is common knowledge that more than 90% of the world's farm population is far from having its basic industrial implements, modern farm machinery and domestic innovations. If appropriate arrangements could be devised, none of our factories which are now producing the weapons of war—the tanks, jeeps, planes, ships, and ammunition—need be scrapped entirely.

On the contrary, there is ample need for their conversion into the production of consumer goods and farm implements. There is even now greater need for tractors than for tanks, and this will be so for many more years to come. The organization of the Food Supply Trust will increase food consumption and guarantee the farmer a safe market for his products, regardless whether the farmer grows essential or luxury crops. The farmer will thus receive credit, and economic confidence will keep the wheels of production going. Hence after the war there can be immediate conversion, and our level of employment need in no way slump. Nor does the farmer need to lower his production goals. The credit of the Food Trust will be good, and the farmer will be able to maintain his high production, knowing that he can get machinery and goods for his money. The food processing industries, the middleman and the grocery stores will remain on their jobs so long as the tasks they perform are of service to the consumer.

The function of the British Food Ministry today provides us with an actual model, which if viewed together with the stamp plan of the United States and the rationing of both countries, leaves nothing to be desired as reasonable evidence that the scheme has distinct possibilities. In Britain, imports, exports, and distribution are fully controlled, and yet the British food industry continues to do quite well. Prices too are controlled, and the consumer is fully protected. It is, of course, important that this social enterprise be run and controlled by an impartial committee consisting of nutritionists, sociologists, economists, public health representatives, industry, commerce, farmers, and labor. The governing body should be like a board of trustees, and the business should be conducted on a profitable basis. It is desirable that it accumulate vast reserves, that it have the right to float loans, sell shares, and in general act like a business with some government and popular control.

It seems plausible to expect that this type of food production and distribution organization would do away with the cash crop evil and alleviate the difficulties ensuing to nations as well as to communities from the single crop system. These evils may be particularly bad after the war and are at best at the mercy of the waywardness of economic trends and fancies of the period.

There is reason to believe that this scheme may prove workable on an international scale if it can at all operate on a national level. It is likely that it has the means of coordinating the food production and distribution of different states and different geographic regions. It might be able to do that even for the entire world, with exchanges between nations through an international system of exchange and finance.

It is certain that many nations will be dependent upon others, even though the present war has stimulated national self-sufficiency. An International Food Trust may help such nations obtain their quota of the nutrients they must import and may help them produce products to pay for those articles.

Self-sufficiency as such is not a desirable goal and is certainly hostile to all hopes for mutual cooperation of nations. Independence

and interdependence of nations must go hand in hand. Self-sufficiency leads to selfishness, acute nationalism, lack of understanding of neighbors and other evils breeding war and dreams of conquest. The problem is not how to make nations self-sufficient, but how to make them so interdependent as to encourage mutual respect, understanding and cooperation.

It is obvious that an international extension of this plan could have great stabilizing powers for peace. It will make known exactly how much food each nation produces and what reserves it contains. It will make known what nation becomes restless, prepares for war and lays down heavy reserve stocks. It will also act as a powerful whip against recalcitrant nations.

In many ways this is a far superior weapon for peace than an air force or a standing police force. It is more reasonable, more effective and less frightening; nor can it be used by politicians and dictators as readily as armies can.

The international committee might be in the form of a federated agency, joining representatives of national trusts, cooperating with the national trusts and coordinating their efforts. It should maintain its own staff and be composed of nutritionists, sociologists, representatives of business, labor, etc., like the national groups. It need not maintain a military force but would require the aid of a force of inspectors and informants in every country to keep close watch over local situations. It should be free from politics and should be run by people of tested honesty and true social and scientific vision assisted by some elected representatives.

Such international cooperation will have another advantage. The League of Nations after the last war sought to combine the activities of its members in terms of the rather remote goal of justice, diplomacy and international cooperation. It lacked roots that would sink into the solid soil upon which the common people walked. It lacked contacts with every man and failed to make the so-called common man aware of its function and role in his daily life. For this reason he never looked upon it as an institution serving him directly, but rather as an institution of governments and diplomats.

The existence of an International Food Trust might change such an attitude. It can convey to the people the practical evidence of the need of cooperation as well as its immediate benefits. In matters relating to government, international affairs, as well as his own well-being, the citizen will know that that agency affects him directly and that upon its functions depend his food and his welfare. In this fashion cooperation among nations will be made vital to his life. A food insurance scheme of this type may not solve all our problems but may help to solve the problem of our daily food; and in the solution of small and concrete problems lies the hope of humanity. Grandiose schemes appeal to our sense of romance and to our poetic sense of justice on a large scale. In practice they have not been very helpful. For this reason it may be well worth giving this less spectacular plan, built on faith and hope, an opportunity to prove itself.

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